PUBLIC WORKS

Mar. 1951

CITY, COUNTY AND STATE

...e Side Parking Aids in Street Cleaning

...adrupling Sewage Treatment Plant Capacity

...nusual Flexibility Features New Water Plant

...and-Spit Highway Construction Offers Many Problems

...ew Insecticides and Methods for Pest Control

...ptic Tank Design for Food Waste Disposers

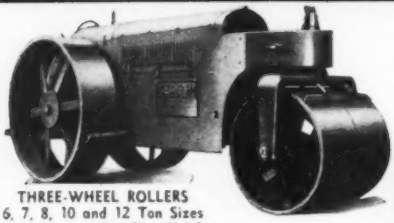
Leaders in the Public Works Field: R. W. Davis, Chief Equipment Engineer, N. C. State Highway and Public Works Comm. More on page 22

YOU NEED-

GALION MOTOR GRADERS & ROLLERS

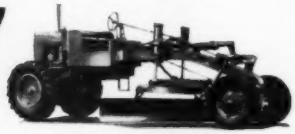
FROM START TO FINISH

on any grading or rolling job you need GALION'S proved -

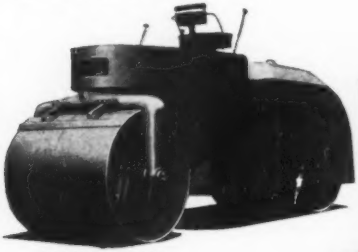


THREE-WHEEL ROLLERS
6, 7, 8, 10 and 12 Ton Sizes
With Cast or Variable Weight
Ballastable Steel Rolls
Gasoline or Diesel Engines

ECONOMY OF OPERATION

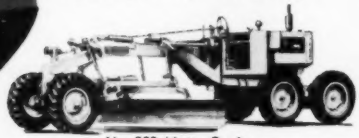


No. 402 MOTOR GRADERS
Light-Duty, 31 h.p. Gasoline Engine

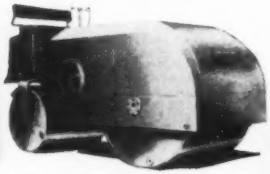


TANDEM ROLLERS
Variable Weight -- 5-8, 8-10,
8-12 and 10-14 Ton Sizes
Gasoline or Diesel Engines

DEPENDABLE SERVICE

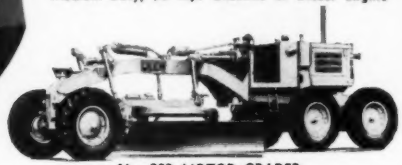


No. 303 Motor Grader
Medium-Duty, 50 h.p. Gasoline or Diesel Engine



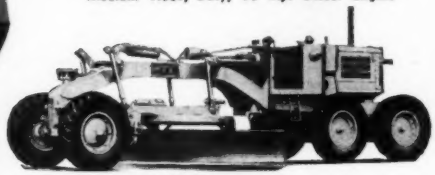
SMALL TANDEM ROLLERS
Variable Weight -- 3-5 Ton
Gasoline Engine

EASE OF HANDLING

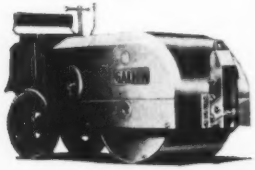


No. 203 MOTOR GRADER
Medium Heavy-Duty, 70 h.p. Diesel Engine

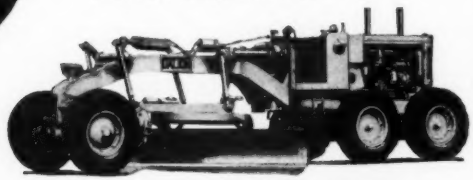
SUPERIOR PERFORMANCE



No. 104 MOTOR GRADER
Heavy-Duty, 76 h.p. Diesel Engine



PORTABLE ROLLER
Variable Weight -
7100-9765 lbs.
Gasoline Engine



No. 118 MOTOR GRADER
Extra Heavy-Duty, 100 h.p. Diesel Engine

Write for literature on type of equipment in which you are interested.

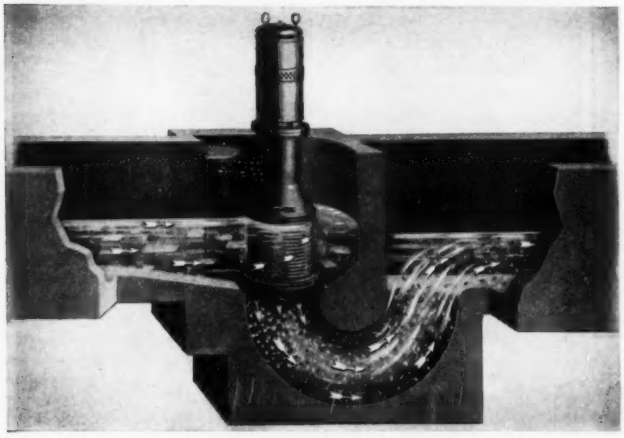
GALION

ESTABLISHED 1907 **MOTOR GRADERS • ROLLERS**

THE GALION IRON WORKS & MFG. CO., General and Export Offices — Galion, Ohio, U. S. A.
Cable address: GALIONIRON, Galion, Ohio

For more details circle No. 48 on Readers' Service card

CHICAGO COMMINUTORS cut coarse sewage matter into small settleable solids without removal from channel



NO

Hauling
Burial
Incineration

THE CHICAGO COMMINUTOR provides a clean, odorless, automatic method of disposing of coarse sewage matter. It cuts coarse sewage matter into small settleable solids without removal from the channel. It is not necessary to manually or mechanically rake screenings and dispose of them by burial or incineration.

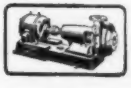
The Chicago Pump Company developed and perfected the only comminution process. Every CHICAGO COMMINUTOR is backed by 16 years experience and 2500 installations. Rugged construction with precision engineering assures long, trouble-free operation. The COMMINUTOR is available in a range of sizes to meet all requirments. Write for full engineering data.

YOU CAN DEPEND ON THE
CHICAGO
COMMINUTOR
16 YEARS EXPERIENCE
2500 INSTALLATIONS

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2348 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**



Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

For more details circle No. 152 on Readers' Service card

OLIVER DIESEL POWER

What better proof could you ask of the *economy* you get with the new Oliver "88" Diesel Wheel Tractor? On this job an "88" Diesel is handling *two* rubber-tired compaction rollers vs. a gasoline powered tractor of equivalent size pulling *one* roller. The owner reports a fuel cost saving of 50% even though the Diesel model was pulling a load of 39,000 lbs. vs. the Gasoline model pulling a load of 25,000 lbs.

The new Oliver "88" is a natural for industrial wheel tractor operations. It's remarkably easy to start . . . requires no starting preparations. Overall efficiency is high due to superior air and fuel mixture. Efficient burning of fuel and air assures exceptional fuel savings. Prolonged piston head pressure increases lugging ability under heavy loads.

You'll find it will pay dividends in increased load handling ability . . . lower operating costs to investigate the new Oliver "88" Diesel Industrial Wheel Tractor. Your Oliver Industrial Distributor will give you the complete story.

THE OLIVER CORPORATION

Industrial Division: 19300 Euclid Avenue, Cleveland 17, Ohio

A complete line of Industrial Wheel and Crawler Tractors

For more details circle No. 204 on Readers' Service card

PUBLIC WORKS
Magazine

Edited by W. A. Hardenbergh and A. Prescott Folwell

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CONTENTS

MARCH, 1951

Additions Quadruple Sewage Plant Capacity. *By M. E. Boyden and R. L. Smith* 35
4-Lane Highway for Puerto Rico 37
One-Side Parking Aids Street Cleaning. *By Henry Liebman* 38
Unusual Flexibility Features Water Plant. *By F. E. Wenger* 40
Construction Problems on Sand-spit Highway. *By Mark McMillin* 43
New Insecticides and Methods for Pest Control. *By A. M. Livingston* 46
How System Head Curves Solve Pump Buying Problems. *By T. F. Keating* 48
Septic Tank Design for Food Waste Disposer 51
Controlling Rats in New York City 53
Sewage Sludge Converted to Soil Builder and Fertilizer 56
Sanitary Landfill Experience at Memphis 58

PUBLIC WORKS DIGESTS

The Water Works Digest 66
The Highway and Airport Digest 73
The Sewerage and Refuse Digest 78

PUBLIC WORKS ENGINEERING DATA

Air Tools Indispensable for Trenching. *By Walter Turner* 26
Cost of Laying Water Pipe in 1949 26
Transparent Envelopes Trace Water Currents 26
Water Filter Reconstruction Costs 28
Highway Construction Cost Trends 28
New Equipment Reduces Road Cost 75% 28
Washing Filter Sand in Charleston 60
Sanitary Landfill in a Cold Climate 83
Storage Tank On a Man-Made Hill 84
Phenol Waste Treatment by Chlorination 85

DEPARTMENTS AND SECTIONS

Editor's Page 7
Letters to The Editor 18
Books in Brief 20
Leaders in Public Works 22
Public Works Equipment 87
The Engineers' Library 93
Worth Telling. *By Arthur K. Akers* 98

THE ENGINEERING AUTHORITY
IN THE CITY-COUNTY FIELD

Clean pipe thoroughly — then center brass band over break, bending tab back to lock.

Thoroughly soap both sides of gasket and pipe with heavy soap water.

Center gasket and Monel Band over brass band.

Assemble halves of clamp over pipe and bolt together.

Insert pull bolts and tighten all around evenly.

REPAIR BROKEN MAINS
IN 5 TO 15 MINUTES one man can install a Skinner-Seal Split Coupling Clamp—make a dependable, lasting repair. Built to outlast the main. Tested to 800 lbs. Be prepared — order today.
M. B. Skinner Co., South Bend 21, Indiana, U.S.A.

SKINNER-SEAL SPLIT COUPLING CLAMP

For more details circle No. 214 on card.

THE EDITOR'S PAGE

For Better Distribution of Chlorine During The Emergency

A RECENT order of the government limits chlorine use to the amounts used during the past year; omits mention of chlorine for swimming pools; and prescribes rather complicated and difficult measures for getting additional needed amounts of this essential chemical.

An adequate free chlorine residual is the best protection we know of against chemical and bacteriological warfare and against the kind of blunders that occur from time to time—for instance, opening the wrong valve; forgetting about that cross-connection; or starting the ship's fire pumps while it is connected to the city mains. Chlorine will not cure all of these ills, but it helps a lot.

This cutting down on sanitary requirements is not, to our mind, a very wise procedure for the sanitary use of chlorine is small—something like 5% to 7% of the total chlorine production. But if it has to be done, why not allot to the State Sanitary Engineer a reasonable amount of authority to divert chlorine supplies within the state as required by public health? In this way, he could cut down on sewage chlorination, for instance, and use the excess chlorine for water treatment. The State Sanitary Engineer knows better than anyone else what requirements must be met in his state. It would be wiser to give him the flexibility to meet these conditions than to require a long-drawn out and laborious procedure on the part of a community that needs more chlorine. The result would probably be that, with no greater use of chlorine, the requirements of sanitation would be met in a far more effective manner.

Stream Pollution Prevention is Easier Than Cure

Already some of our large ordnance plants have gone into operation and there seems little doubt that other plants will be activated from time to time. Most of these plants, from the water supply and waste disposal viewpoints, are immense, with installations to treat millions of gallons daily.

A good operator is even more important than a good plant to prevent stream pollution. It seems to us that the Public Health Service and the State Sanitary Engineers should, between them, work out a roster of operators capable of operating efficiently such water and waste disposal plants. By doing this, unnecessary stream pollution would be avoided; and it is easier to avoid pollution than to remove it later.

In addition to working out the roster of capable operators, arranging to transfer them and replace them as needed in order that other plants need not go unattended, there is room for a discussion of sound operating practice with plant management, whether it be government or private industry. All of this ought to be done; we hope it will be done.

Does Coordination Exist in Our Government

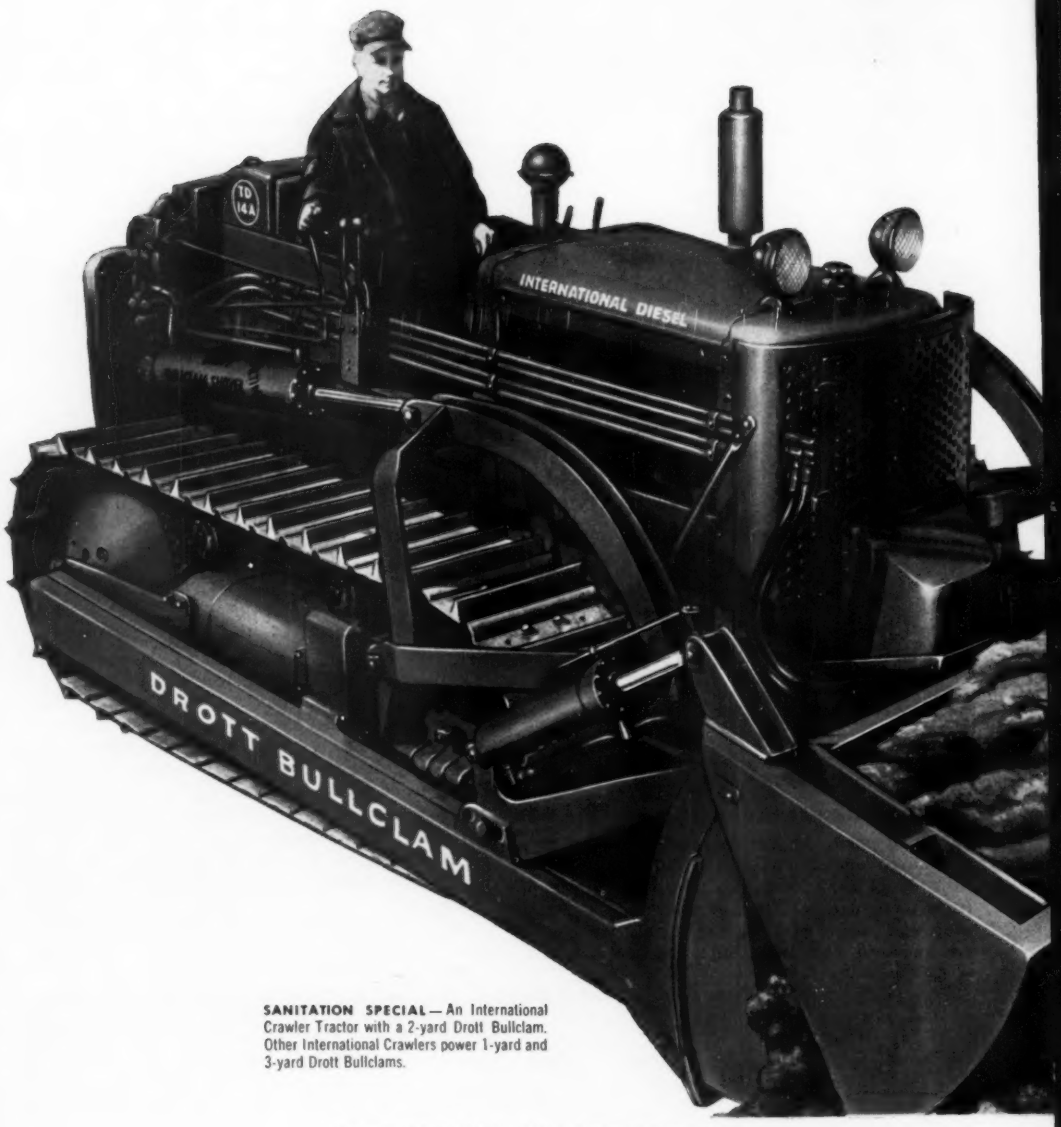
Not long ago a release came to hand describing the new atomic energy installation to be constructed in South Carolina, some 20 miles east of Augusta, Ga. With no effort at all we recalled the huge construction programs for camps and industries carried on during the war; the thousands of construction personnel required for building these installations; the absolute lack of any provision, or even plans, for housing and sanitation for these workmen; and the indescribably insanitary conditions that resulted from this bland shrugging off of any responsibility for such things.

We wonder if the officials—and engineers—responsible for selecting this South Carolina site made any provision whatsoever for the primary and necessary jobs of housing and caring for these workers; if the state health and labor departments were consulted; if other governmental agencies of the nation—health and housing for instance—were given any advance warning; if the counties, towns and villages so vitally affected were given consideration.

If so—well the world does move and learn and advance; if not, someone ought to be given the hotfoot. Whether it is the engineers or the administrative personnel responsible makes no difference.

We asked a question above, but it was pretty near a sure-fire rhetorical question. We are pretty sure that no advance consideration was given to the preparation of plans for housing or providing transportation facilities for either the labor required for construction or for operation after construction. Does the AEC not have engineers who appreciate such matters?

One Man



SANITATION SPECIAL — An International Crawler Tractor with a 2-yard Drott Bullclam. Other International Crawlers power 1-yard and 3-yard Drott Bullclams.

For more details circle No. 146 on Readers' Service card

Sanitation Squad

Here's the only one-man unit specifically designed to do all four steps of the complete sanitary fill job!

You save money, you save man-hours when a Bullclam gets at your garbage. One man, one outfit builds a fill that raises land values at the same time it raises the land itself.

This is the ONLY equipment especially built to handle the whole sanitary fill job. The big Bullclam, powered by all the brute force of the rugged International Crawler, digs in, scoops out the excavation, then tackles the refuse as the trucks dump it, crushing, smashing and grinding the bulk, compacting and ironing it with the specially curved Drott Bullclam front.

The same unit carries the cover dirt, spreads it in place and grades it off—ready for a playground, airport, ball park or similar municipal use.

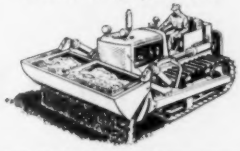
Ask your International Industrial Distributor for details. Or write to Drott Manufacturing Corporation, Milwaukee 8, Wisconsin. And remember, the Bullclam saves you cash and time. It does away with open dumps and smoking garbage burners. It's a community asset any way you look at it.

Drott Manufacturing Corporation
Milwaukee 8, Wisconsin

International Harvester Company
Chicago 1, Illinois

Prepares the site

Crushes and compacts refuse



Transports and spreads earth cover

Grades and levels finished area

BULLCLAM BY

DROTT

POWER BY

INTERNATIONAL

POWER THAT PAYS

For more details circle No. 146 on Readers' Service card

Opening the door for a friend of the community!

Meet the latest, greatest friend of housewives—of sanitary officials—of communities everywhere.

Meet the sure, powerful enemy of garbage—of the filth and disease that garbage breeds.

Greet the new, compact, efficient General Electric Disposall®—designed to fit practically every sink . . . built for years and years of dependable operation!

There's everything new and better about this food-waste shredder—from the all-white, kitchen-bright exterior—to the smallest working part. The shredder and rotating impellers, made of one of the toughest alloys known, will really grind food waste—from rubbery fruit skins to the most stubborn beef bones.

G-E engineers have added safety factors—including the strength to prevent mechanical breakdown if foreign objects of glass or metal should be dropped in accidentally with food wastes.

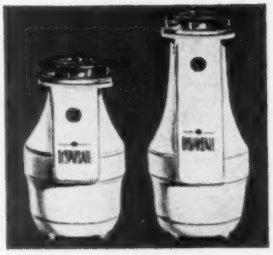
There's built-in economy, too! For, on a yearly average, this G-E Disposall will use less electricity than an electric clock—will use less water than is now required to clean sinks, sink strainers and to flush out garbage containers. And, because it is built and designed for a long life with little or no maintenance, the actual owning cost of a Disposall has been found to average as little as 10¢ per unit per year.

First, last and always, though, the Disposall means SANITARY PROTECTION. It shreds food wastes to small, uniformly sized particles and discharges them at an even rate—in the combination found best through 15 years of G-E experimentation. And these particles are washed away in water with a scouring action that keeps traps and pipes whistle-clean.

Whether wastes are disposed of through sewer or septic tank, the G-E Disposall preserves the full benefits of the sanitary plumbing system—all the way from sink to sewage treatment plant!

Truly, there is no food-waste shredder that can match the new G-E Disposall in design, in performance, in dependability.

As guardian of the community, of its health, safety and economy, you will surely want to open the door for a great friend of the community—the new G-E Disposall!



New, streamlined G-E Disposall is available in two models. Quick, easy installation can be made in practically every sink. For further information about the Disposall method, simply write to Department PW 351, General Electric Co., Bridgeport 2, Conn.

G-E DISPOSALL

You can put your confidence in—

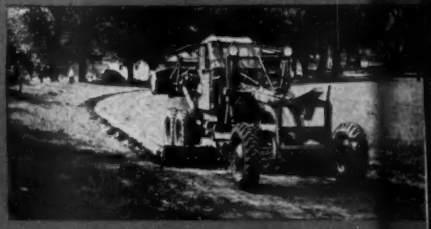
GENERAL ELECTRIC

For more details circle No. 243 on Readers' Service card

SNOW REMOVED AT THE RATE OF 150 YARDS PER HOUR in Galena's business section. Operation included windrowing snow with grader blade, then loading into trucks with rear-end loader. Parking facilities were quickly restored. V-type snowplow was used on the Model D to open outlying roads.

HOW TO GET *More Mileage* FROM YOUR *Road Maintenance Dollar*

USE THE ALL-AROUND, LOW-COST ALLIS-CHALMERS MODEL D MOTOR GRADER—



ONE WEEK'S GRADING IN ONE DAY. The Model D does more grading in a single day for Galena than the old tractor and towed grader did with two men in one week.

Produces at Both Ends... As Well as in the Middle

One man handles the work of a crew with the low-cost Model D! Does a better grading job with tandem drive and other big grader features . . . and is an all-year, all-around outfit with easily attached accessories.

In Galena, Ill., for example, a Model D with loader, scarifier and snowplow attachments speeded all phases of road maintenance, snow removal and material handling . . . *and decreased manpower requirements for these jobs by more than 40 percent!* That's cutting labor costs almost in half.

Like Galena, you can get more mileage from *your* road maintenance dollar with the versatile Model D. Let your Allis-Chalmers dealer prove it . . . NOW!

WORKS ON STEEP GRADES—WINTER AND SUMMER. Many grades are more than 22 percent in Galena's hilly terrain. Tandem drive and rear-engine design give the Model D ample power and traction to work these steep grades the year around—shaping, disking, plowing snow.

Some of the Easily Mounted Attachments that Make the Model D the Most Useful, All-Around Grader on the Market Today

REAR-END LOADER. Hydraulically operated, ⅜ cu. yd. bucket . . . available with bucket teeth.

V OR BLADE-TYPE SNOWPLOWS. Interchangeable, hydraulically operated. Blade plow may also be used for backfilling and light 'dozing.

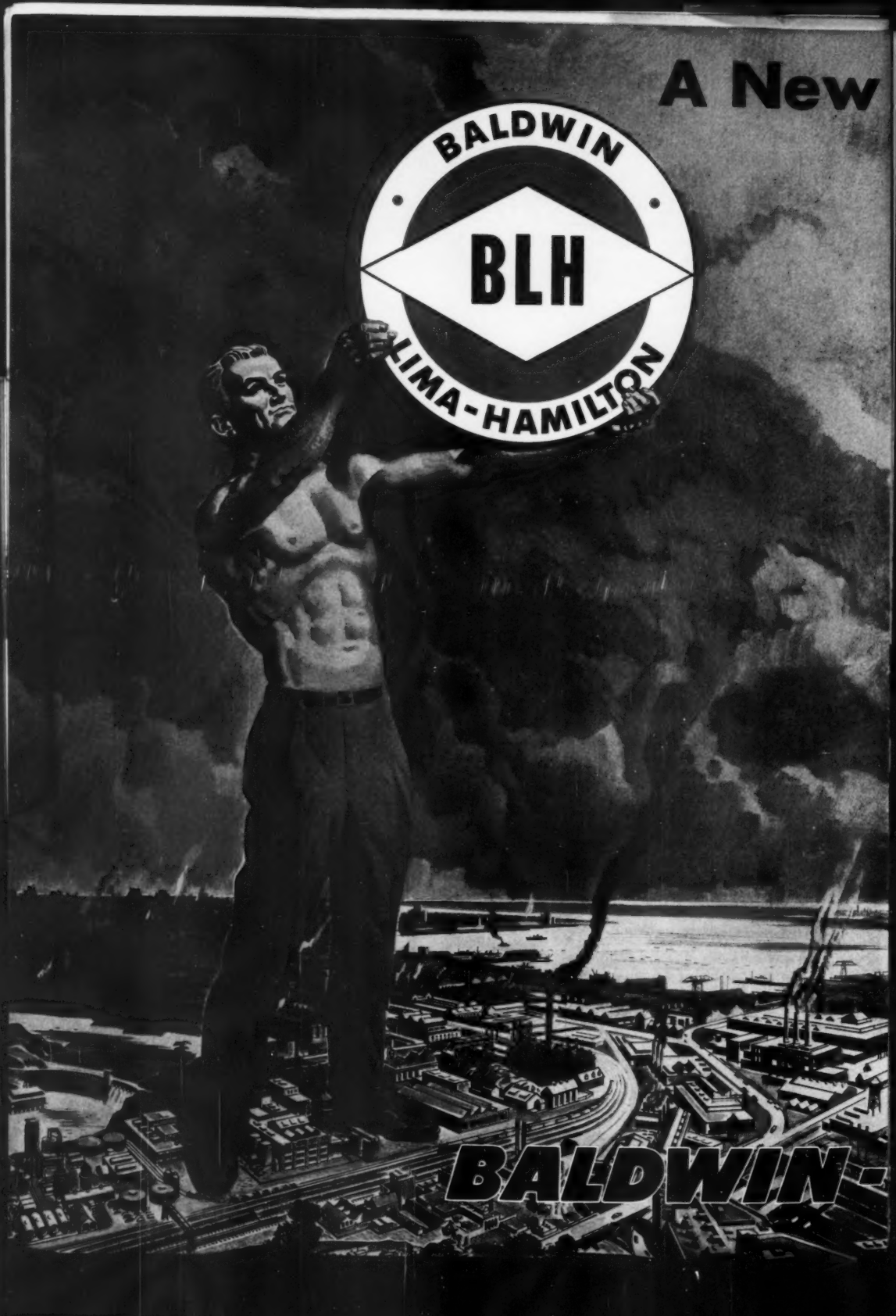
SCARIFIER MOUNTS behind grader blade . . . makes full use of weight and traction . . . steering is much easier.

WINDROW ELIMINATOR. Saves extra passes by feathering out windrows.

Also: All-View cab — easy to remove and replace . . . heavy-duty front tires and other special accessories.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.


A New
BALDWIN
BLH
LIMA-HAMILTON
BALDWIN-

Symbol of Service to Industry

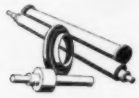
Representing the combined facilities of two of America's leading suppliers of industrial machinery and equipment, this new Baldwin-Lima-Hamilton symbol is backed by many decades of experience, a progressive and continuing research program, and the most modern engineering and manufacturing techniques. It represents the activities of eight plants spotted from coast to coast and numerous established sales outlets, strategically located for prompt, competent service.

The dispersion of B-L-H manufacturing facilities permits "local" handling and delivery on many items to the important producing areas. It also conforms to the projected pattern for better national defense.

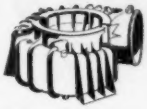
You have undoubtedly used many of the products offered by Baldwin, by Lima-Hamilton and by various subsidiaries, but you may not know, today, how well the Baldwin-Lima-Hamilton Corporation is equipped to supply your needs.

This array of products will suggest added opportunities for you to benefit from the expanded production-distribution-service facilities Baldwin-Lima-Hamilton now offers.

INDUSTRIAL LOCOMOTIVES—Gasoline, Diesel and Diesel-electric powered.



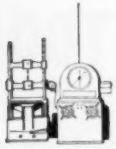
STEEL FORGINGS—Hammered and pressed steel forgings—rolled rings and flanges.



IRON CASTINGS—The most complex shapes, in weights up to 100,000 lbs.

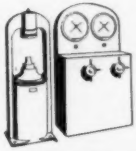
NON-FERROUS CASTINGS—For corrosion resistance. Also special alloys available.

HYDRAULIC PRESSES—All types and capacities. Complete standard line.

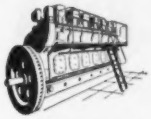


TESTING MACHINES AND INSTRUMENTS—Universal, Fatigue, Stress Analysis.

STRAIN GAGES AND INSTRUMENTS—For an accurate picture of stress distribution.



CONCRETE TESTER—From 90,000 lb. units up to 1,000,000 lbs.



DIESEL ENGINES—For stationary and marine applications.

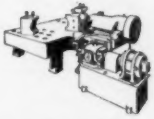
CRANES—Full range of capacities up to 110 tons, crawler and rubber mounted.

SHOVELS—Capacities from $\frac{3}{4}$-yd. to 6-yd. Design features increase output.

DRAGLINES—Available in variable capacities for economical earth-moving performance.

HYDRAULIC TURBINES—Francis, Propeller, Kaplan and Pelton types.

VALVES—Large valves for hydro projects and water works applications.



PIPE BENDERS—Speed and simplify the bending of large pipe in jobbing and repair shops.

Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pennsylvania. **Plants:** Eddystone and Burnham, Pa.; Lima, Hamilton and Middletown, Ohio; Rochelle, Illinois; Greenwich, Connecticut; San Francisco, California. **Offices:** Chicago, Cleveland, Houston, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis, Washington

LIMA-HAMILTON

For more details circle No. 43 on Readers' Service card

"Cat" Bulldozer

AMERICA'S ALL-PURPOSE TOOL

Gouging out hillside to reline and widen road in San Benito County, Calif., this rugged "Caterpillar" Bulldozer slugs out a win over tons of abrasive granite, shale and decomposed asbestos —the cutting edge of this tough blade can take it. The unit's economy of operation and long service life save the taxpayers' dollars. And another reason for picking this "Cat" all-purpose tool for the job is given by E. R. Hanna, San Benito Road Commissioner: "We use 'Caterpillar' equipment because our men demand same!"

These machines give you matched design—tractor and 'dozer built to work together. This rugged team is a bear at meeting work schedules. Sturdy construction and the extra-quality materials used throughout enable it to keep punching full time without down-time, and the special steel cutting edge of the blade hammers through the toughest going. Most important of all, the precision methods used in "Caterpillar" factories build extra years of life into these bulldozers.

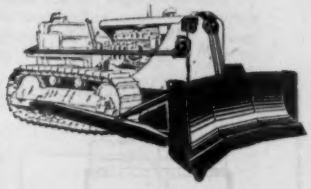
For help with your equipment problems, see your "Caterpillar" dealer *now*. Today's expanding military program has high priority. But it is recognized that our national preparedness depends upon stepped-up civilian production too. We must have more lumber, coal, food and essential ores. We must continue to build and improve America's vital network of highways. So your "Caterpillar" dealer is especially interested in meeting your needs—through equipment replacement and by exercising his working partnership with you to keep the machinery you have *on the job*.

CATERPILLAR, PEORIA, ILLINOIS

This "Caterpillar" D7 Tractor with matching No. 7S 'Dozer is relining and widening 1½ miles of Panoche Road in San Benito County, California. On an 8-hour-day schedule, this bulldozer shows a complete work cycle of 100 ft. per day. San Benito County also uses "Caterpillar" No. 12 and No. 112 Motor Graders for best job production at low cost. Price of a standard "Caterpillar" D7 Tractor is $11,010: No. 7S Bulldozer, $1,535: No. 25 Cable Control, $1,630, f.o.b. Peoria. Prices subject to change without notice.

"CATERPILLAR" BULLDOZER EXTRA FEATURES

1. Tractor and 'dozer *broken to harness*, and a size for every need.
2. Moldboard curvature for active, *rolling*, higher production loads.
3. Box section side arms—extra thick at points of greatest stress.
4. Choice of straight or angling type of blade, simple to maneuver and easy to adjust or detach.
5. Your choice of hydraulic or cable controls.
6. The power of the "Caterpillar" Diesel Engine is geared to blade *capacity*.



NEW ADDITION TO 'DOZER LINE

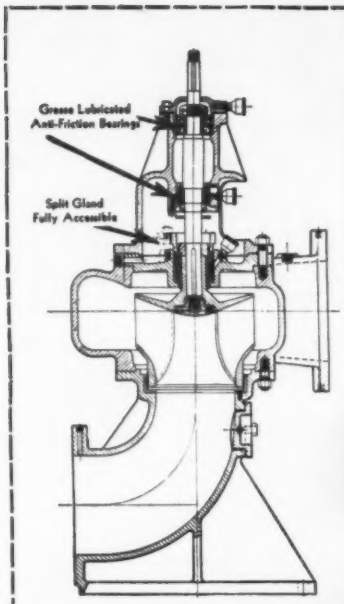
Here's a specialist that can step up production and cut costs. It's the brand new No. 8U 'Dozer for use with the "Caterpillar" D8 Tractor with cable control. Working best in loose or light material, the end portions of the No. 8U 'Dozer's blade extend forward, giving it a flat U shape which enables it to drift large loads, making it practicable to bulldoze longer distances for bigger production. The No. 8U is built to the same high standards of strength and long life as the other "Caterpillar" Bulldozers. The versatility of this new tool gives it excellent performance on all kinds of 'dozing jobs, from stockpiling to pioneering.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES · TRACTORS · MOTOR GRADERS · EARTHMOVING EQUIPMENT

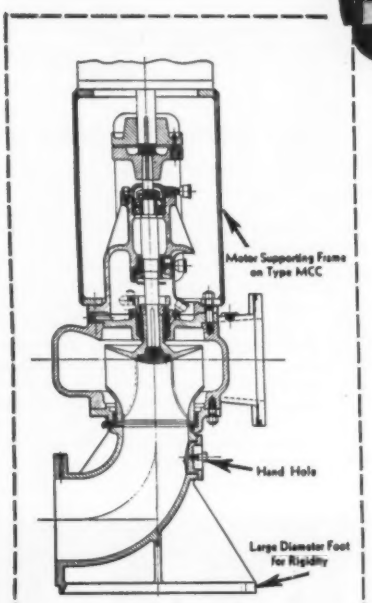
There's a Mixflo Pump
THAT WILL MEET YOUR SEWAGE DISPOSAL NEEDS— *Exactly!*



Type MCV
(Motor separately mounted)

Mixflo, Type MCV
with base elbow suction nozzle

Worthington Offers The Largest Selection Of Sizes And Types In A Single Line



Type MCC
(Motor close mounted)

Non-clogging two-vane closed impellers, grease-lubricated anti-friction bearings, easy accessibility to the split stuffing-box gland and impeller eye . . . are typical of the many Worthington Mixflo features assuring low-cost, trouble-free sewage pumping.

No Need To Guess!

And along with performance-proved excellence in every mechanical and hydraulic detail, the Mixflo line offers you the widest choice of sizes and types in the field. So there's no need to compromise on a pump that's "about" right — you're sure to find a Mixflo that's *exactly right* for your particular requirements.

Bulletin W-317-B16 describes the various Mixflo types made in 10", 12" and 16" sizes. Worthington also builds Mixflos in sizes up to 84", with open or closed impellers and for horizontal or vertical drives. For more Mixflo facts that prove *there's more worth in Worthington*, contact our nearest District Office. Or write to *Worthington Pump and Machinery Corporation, Harrison, N. J.*

MEMBER

WORTHINGTON

W0.2

For more details circle No. 201 on Readers' Service card

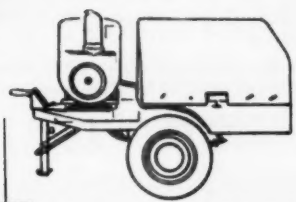
This **GRIFFIN** **EMERGENCY**

TRAILER-type **Power Plant**

...furnishes LIGHT and POWER instantly, – anywhere!

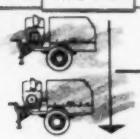
Simply hook the GRIFFIN HIGH-LIGHT TRAILER to a car or truck and your portable power house is ready to bring light and electric power into remote areas. Cities and municipalities will find it indispensable for night operation on highways and for sewer or water line repairs or when power lines fail. Will provide power for electric tools as required.

The GRIFFIN HIGH-LIGHT TRAILER is delivered ready for immediate service.



GRIFFIN HIGH-LIGHT TRAILER

A MODEL FOR EVERY EMERGENCY NEED



6.3 KVA	SINGLE PHASE A.C. 60 CYCLE 120 VOLTS — FOR LIGHT
7.5 KVA	SINGLE PHASE A.C. 60 CYCLE 120 VOLTS — LIGHT AND POWER

An ideal standby unit for municipal and city public works departments . . .

A must for CIVIL DEFENSE!

GRIFFIN
EQUIPMENT CORPORATION

881 East 141st Street, New York 54, N. Y.

GRIFFIN EQUIPMENT CORPORATION
881 East 141st Street, New York 54, N. Y.

Please send HIGH-LIGHT information checked:

☐ 6.3 KVA HIGH-LIGHT TRAILER FOR LIGHT
☐ 7.5 KVA HIGH-LIGHT TRAILER FOR LIGHT AND POWER

Name .....
Address .....
City .....

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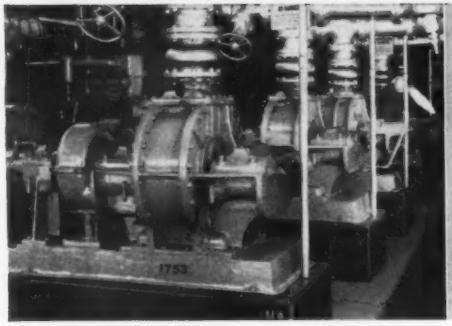
NO V-P-I WORRIES WITH R-C BLOWERS



ROTARY

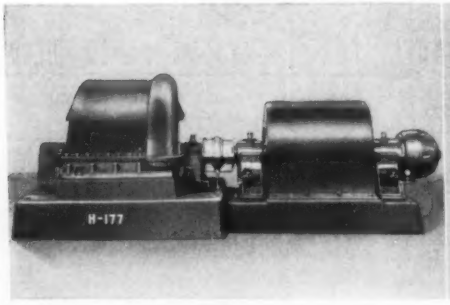
Group of R-C Blowers in midwestern sewage treatment plant, installed 10 years ago and giving excellent service. Capacity of each, 1,800 cfm.

Continuous separation processes in modern sewage treatment depend upon adequate performance of blowers. You can be sure of positive Volume, at the required Pressure and at Low power cost when Roots-Connersville Blowers move the air.

You can obtain this freedom from worry by selecting either R-C Centrifugal or Rotary Positive equipment from our exclusive *dual-ability line*. For large municipal plants, R-C units deliver up to 100,000 cfm. For industrial waste treatment, using small blowers, we supply Rotary Positive units with volume as low as 5 cfm. This wide latitude permits use of blowers closely matched to demand, with resultant economy in first cost and in power consumption.

The services of R-C engineers are always available to help select the best equipment for the sewage treatment job to be done.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Poplar Avenue, Connersville, Indiana



CENTRIFUGAL

A 3-Stage, Type H Centrifugal Blower for aerating sewage. Capacity 15,000 cfm.

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

For more details circle No. 122 on Readers' Service card

LETTERS TO THE Editor

SPANISH EDITION

I have the pleasure of soliciting your authorization for the Administracion General de Obras Sanitarias de la Nacion to reproduce, for its exclusive use, the text, translated into Spanish, with photographs and drawings, of the following two papers: "The Operation of Water Treatment Plants" and "The Operation of Sewage Treatment Plants." These I consider to be of great value to the technical staff of this institution.

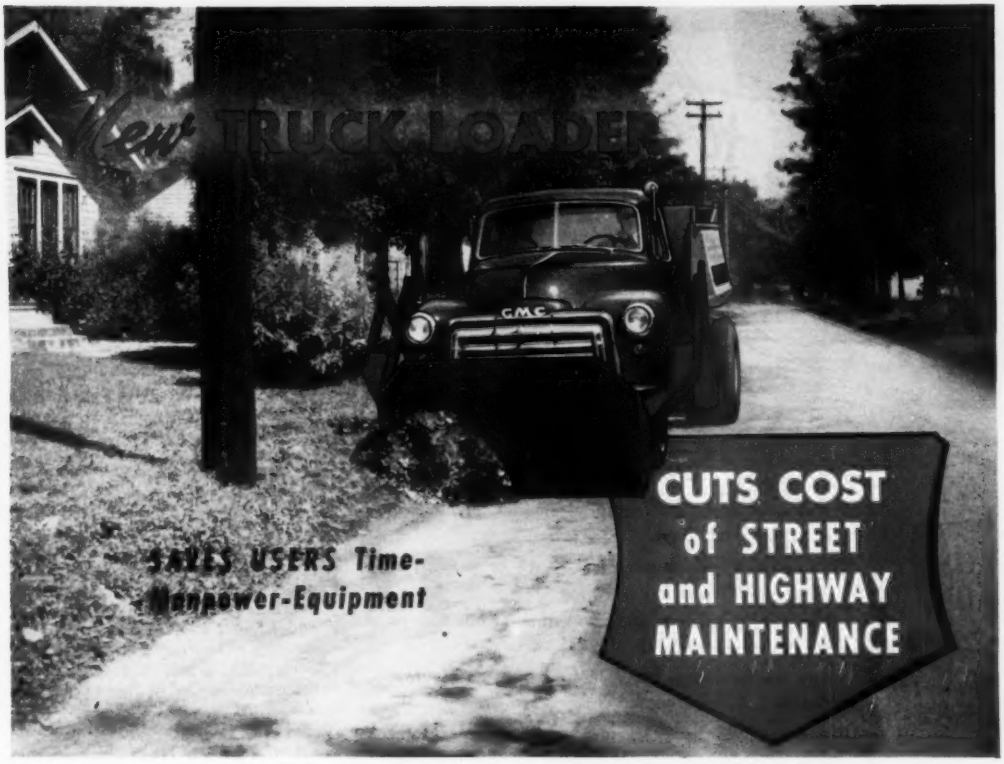
Eng. Julio Cavicchia,
Secretario General Technico,
Administration General de Obras Sanitarias, Buenos Aires.
(Ed. Note.—Permission granted).

GRANDPA'S OWN & DISPOSALLS

This will acknowledge my grateful acceptance of your "token of appreciation" for my recent article. The further development of the Department of Streets & Improvements since the writing of the article has been as rewarding as the first year, if not more so. There has always been a tendency for small communities to assume that they are too small to mechanize. However, due to the limited manpower a small town can sustain, it is imperative that these employees be equipped with versatile machinery to multiply their effectiveness.

We have the past blending with the present. Homes with Grandpa's own outhouse next to homes with every modern device, including Disposalls and television. In our long range planning we are continually confronted with unusual problems. In the consideration of zoning, for instance, we must take into account vertical zoning because the entrances to buildings on Main St. are to commercial and industrial establishments, while the entrances to the same buildings on the next parallel street, Bench St., are into 3rd and 4th floor residences.

I have noted a gradual change in Public Works, one which is in the direction of articles on the prac-



THE NEW Holmes-Owen Loader offers a very practical solution to the problem of today's increasing cost, on street and highway maintenance jobs. The installation of a self-loader reduces the cost of such operations for with this driver-operated unit, one man now does the work of several. The versatile one-man operation of a loader-equipped truck, not only speeds up material handling but substantially reduces the cost per ton handled. It saves time, labor and equipment by permitting the truck driver to do his own loading, hauling, and unloading without extra help or the use of more costly equipment. The new truck loader is today being profitably used by states, municipalities, contractors and numerous commercial and industrial firms. Write factory today for details on this unit which is unsurpassed for handling stock pile materials, snow removal, cleaning-up and dozens of other practical uses.

Manufactured by
Makers of HOLMES WRECKER Equipment

Permits DRIVER to LOAD, HAUL, DUMP, Do Light DIGGING, Grading, Cleaning-up

ERNEST HOLMES COMPANY
Chattanooga, Tennessee

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if

You need aerial photography, mosaics, planimetric or topographic maps.

You need a scale as large as 1" = 40' or as small as 1" = 10,000'.

You need a contour interval as small as one foot or as large as 100 feet.

You are located in Maine, California, Washington, Florida . . . or anywhere in between.

You need aerial photographs and maps for exploration, development, redevelopment . . . or for any other purpose.

WE ARE READY TO MEET YOUR MAPPING NEEDS WITH TOP QUALITY WORK IN *LESS TIME* AND AT *LESS COST*.

Our aerial photographic and mapping projects to meet a variety of specific requirements are now in progress at the locations indicated on the map.

The book "AIR SPEEDS TO YOUR MAP NEEDS" graphically tells the story of how Jack Ammann mapping can save you time and money. Write today on your letterhead for your free copy.

JACK AMMANN

PHOTOGRAMMETRIC ENGINEERS

829-31 N. ST. MARY'S ST. • PHONE FANNIN 5168
SAN ANTONIO, TEXAS

EASTERN OFFICE-32 HILLCREST • P. O. BOX 411 • PHONE 7-1840
MANHASSET, N. Y.

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tical application and resultant effect of techniques rather than the technical discussions tending to limit the reader to the specific field in which he is most concerned or most conversant. This is commendable, and I wish you every success.

Robert F. Mott,
City Manager,
Galena, Ill.

BOOKS IN BRIEF

PRACTICE OF SANITATION

A new book which everyone engaged in public health will (or should) want to have. Here it what it covers: Disinfection; the sanitary survey; food sanitation; milk and milk products; water supplies; sewage disposal; stream pollution control; solid wastes disposal; ventilation; environmental sanitation; insect and rodent control; and administrative procedures. It is written by two men who know what it is all about—Edward S. Hopkins and Francis B. Elder, with the assistance of specialists in the various fields. 430 pages; 110 figures; 29 tables. Williams & Wilkens Co., Baltimore, $7.50.

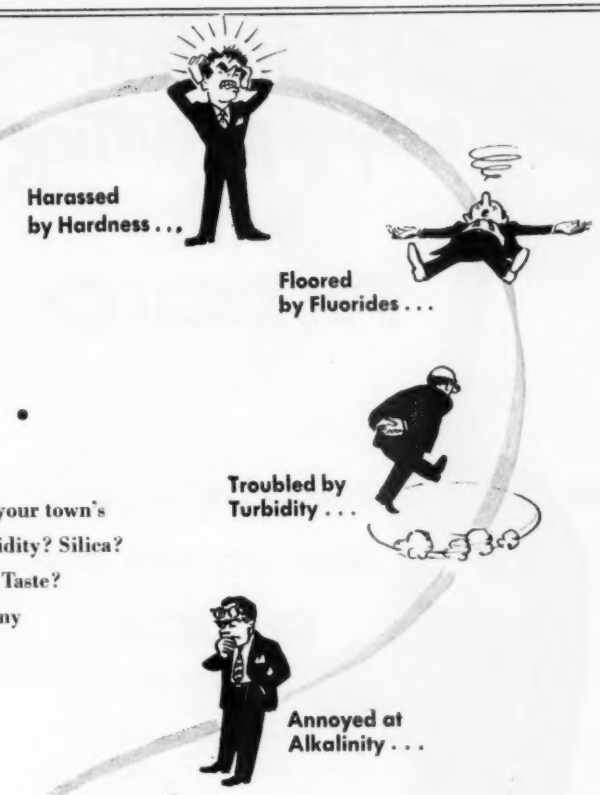
NEW YORK'S NEW BUILDING CODE

The New York State Building Code Commission has issued its proposed one and two-family dwelling code, a 280-page illustrated manual indicating acceptable construction methods and test procedures for acceptance of alternate methods under the code. Structural, fire-safety and sanitation requirements are covered. In structural are such items as snow, wind and earthquake loads. We have no information as to how copies may be obtained. Publication is by the State Building Code Commission, 1740 Broadway, New York 19, N. Y.

VIBRATION IN BRIDGES

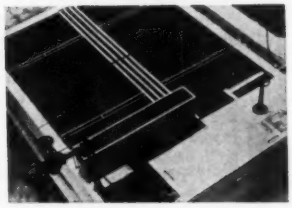
The Mathematical Theory of Vibration in Suspension Bridges is a monumental work produced by a Public Road Advisory Board. Highly mathematical analyses of the dynamic problems involved are presented and experimental data needed to support them are presented. Authors are Dr. Frederich Bleich (since deceased), the late C. B. McCullough, Richard Rosecrans and George S. Vincent. 450

Men with WATER ON THE BRAIN . . .



Is there something wrong with your town's water supply? Hardness? Turbidity? Silica? Alkalinity? Fluorides? Color? Taste? Odor? If you are plagued by any one of them, it's a good idea to specify Permutit water conditioning equipment.

—— *should know about the* PERMUTIT PRECIPITATOR!



The Permutit Precipitator brings you a new and more efficient means for removing impurities from water. It does this by precipitation, adsorption, settling and upward filtration. Its sludge blanket is kept fresh and active at all times. The Precipitator requires less space, less time and less chemicals than previous designs of reaction and settling tanks.

Write today for full information about this economical equipment to The Permutit Company, Dept. PW 3, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

Water Conditioning Headquarters for Over 37 Years

PERMUTIT

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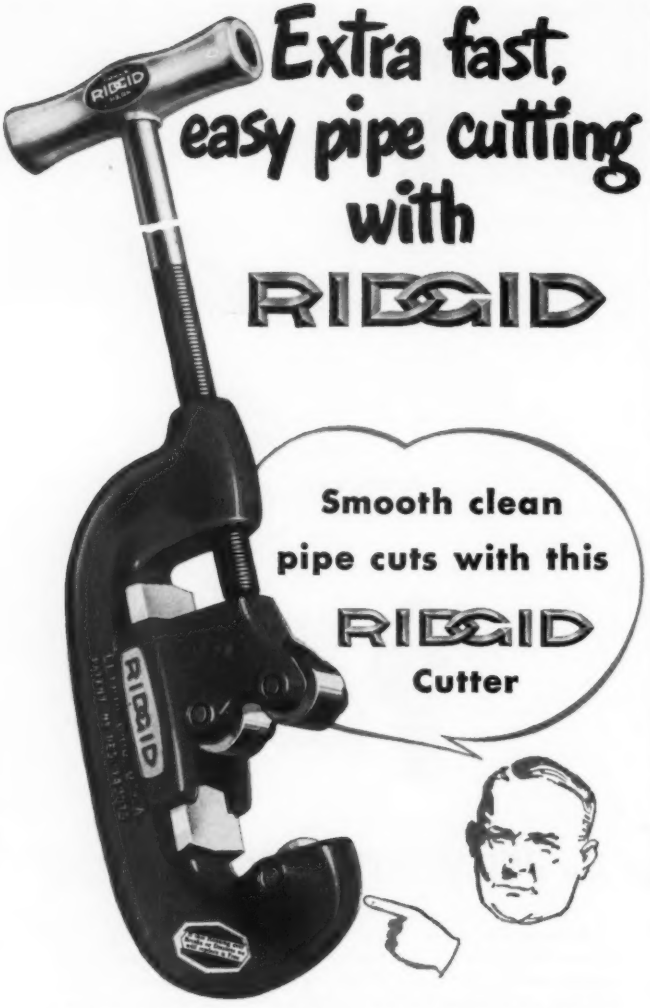


• It rolls right through any pipe with least effort, quick almost burrless cuts—factory tested, tracks perfectly. Special thin-blade cutter wheel for extra fast cutting—or heavy-duty wheel for extra long service. Guaranteed warp-proof special malleable housing. Five models to 6″ pipe; 4-wheel short-handle models for speedy cutting in tight places. For tops in clean easy pipe cutting, buy RIDGID Cutters at your Supply House.

RIDGID

★ Work-Saver Pipe Tools ★

THE RIDGE TOOL CO. • ELYRIA, OHIO

pages; many illustrations. For sale by Superintendent of Documents, Washington 25, D. C., for $1.25.

HIGHWAY PLANNING

This is a copy of "Highway and Thorofare Planning and Programming in Relation to Urban Planning and Development. It was prepared by I. S. Shattuck and K. B. Rykken. Cost is 60 cents per copy from the Highway Research Board, Washington 25, D. C.

LEADERS IN THE PUBLIC WORKS FIELD

Berrien W. Davis of the North Carolina State Highway and Public Works Commission, has progressed up through the ranks of that organization, beginning in 1920 as a resident engineer, then stepping up successively to and through the jobs of assistant division engineer, county engineer, equipment engineer, state maintenance engineer to his present position of chief equipment engineer. More familiarly known as "Red", Mr. Davis was graduated from Auburn, down in Alabama, in 1916 with the degree of BSCE; during World War I, he was a field artilleryman; and, for a short time thereafter, assistant city engineer of Fayetteville. His hobbies? Well, mostly highway equipment and traffic engineering, with fishing present, but maybe down the list a bit.

He is a member of many engineering and professional societies — ASCE, SASHO, AASHO, ARBA, NC Society of Engineers and Raleigh Engineers Club, having served as president of the last two as well as of the NC Section of the ASCE. During World War II, he served as Examiner on Selection of Army Engineer equipment, personnel and Evaluator of Contractors' equipment. He helped organize Ordnance units.

Naturally, he lives in Raleigh with Mrs. Davis; his one daughter has migrated to New York. It is with unusual pleasure that we present this brief sketch of a modest man who has contributed so much to the advancement of engineering.

Recognized by Wholesalers *and* Users *as finest* Copper Water Tube

The experience of over three decades of exclusive tube-making is in every inch of Wolverine copper water tube. That extensive experience embracing technical development and specialized skill has produced a tube of such high quality that its performance is always dependable.

Dependability is of paramount consideration these days. The use of products that will "carry on" without demanding attention is most desirable, for the time otherwise put to repairs and maintenance can thus be utilized for more essential tasks.

Perhaps you cannot get all the tube you want just now, but we're doing our best to make the supplies go around. WOLVERINE TUBE DIVISION, Calumet & Hecla Consolidated Copper Company, Incorporated, *Manufacturers of Seamless, Non-Ferrous Tubing,* 1451 CENTRAL AVENUE, DETROIT 9, MICHIGAN.

Plants at Detroit, Mich. and Decatur, Ala. *Sales Offices in Principal Cities*

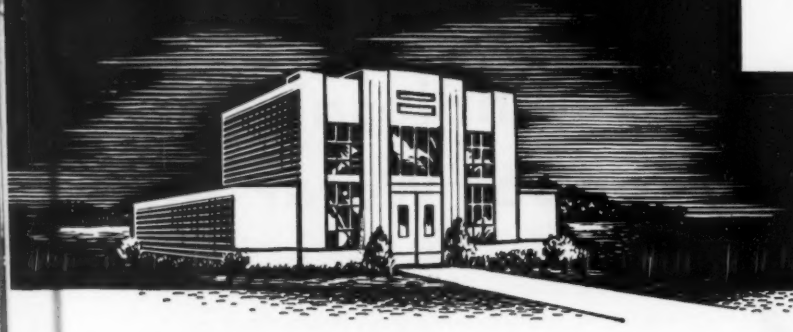
Buy From Your Wholesaler

Export Department, 13 E. 40th St., New York 16, N. Y.

Facts

ABOUT FAIRBANKS MORSE DUAL FUEL ENGINES

* Over 160,000 hp. sold—128 engines—more than any other manufacturer.
* Savings reported over 50% in fuel cost.
* Field conversion parts available for many models.
* Basic Fairbanks-Morse design advantages—2 cycle, low rpm, low BMEP, fewer moving parts, proved record of performance.



A Sure Way to Get Lower Cost Kw-h!

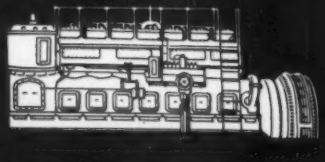
Wherever natural or sewage gas is available, diesel plant operators are producing lower cost kw-h by converting to dual fuel—or installing new dual-fuel engines. Leading the trend in this relatively new diesel development is Fairbanks-Morse, with field conversion parts for many popular sizes of Fairbanks-Morse diesels—and with a growing line of factory-built dual-fuel engines.* If you haven't thought of the savings dual fuel operation can bring to your plant—*you should. When you do, think of Fairbanks-Morse, for no other manufacturer has equal experience in building, installing and servicing dual-fuel engines!* The benefits of this experience are yours for the asking. Fairbanks, Morse & Co., Chicago 5, Illinois.

*Write for information, stating size and type of engine in which you are interested.

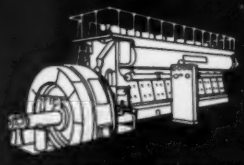
FAIRBANKS-MORSE,

a name worth remembering

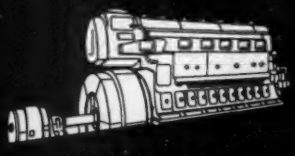
DIESEL AND DUAL-FUEL ENGINES • ELECTRICAL MACHINERY • PUMPS • SCALES • DIESEL LOCOMOTIVES • HOMEWATER SERVICE EQUIPMENT • FARM MACHINERY



Model 31: Up to 3500 hp.



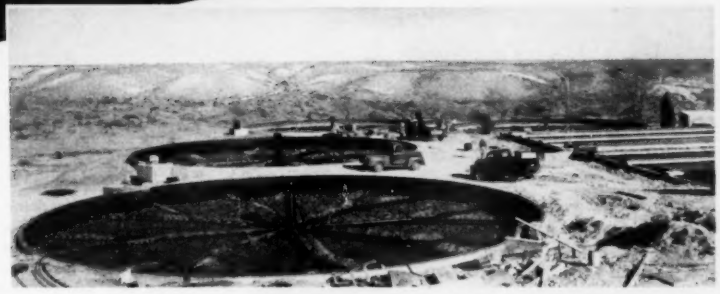
Model 33: Up to 2000 hp.



Model 38: Up to 2000 hp. (Opposed-Piston type)

For Better Trickling Filter Results

Single stage Aero-filter plant at Lubbock, Texas.
H. N. Roberts & Associates, Consulting Engineers.



1. Use TFF Institute SPECIFICATION Underdrains

Trickling Filter Floor Institute *specification* underdrains are used in all modern filters where better results and trouble-free operation are desired. They are scientifically designed for that purpose and made of the finest quality vitrified clay. The size of the top openings insures proper ventilation of all the filter media and free discharge of the filter effluent. The run-off channels are extra smooth for non-clogging, quick drainage.

These blocks will carry applications up to 50 MGAD. Unskilled labor can lay them easily because they are light-weight and self-aligning. And the blocks are strong enough to work on after laying and to support safely even very deep filter media. They are best for all kinds and shapes of filters.

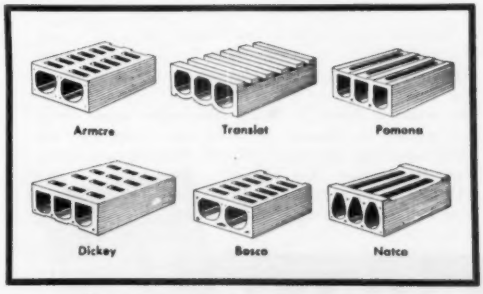
On *your* next filter, use the best equipment you can get . . . and give it a *specification* floor of *Vitrified Clay Filter Bottom Blocks*. Ask any member of this Institute for full engineering details. Write today.

These one-piece blocks are: Easy to Lay, Acid Resistant, Proved by Use, Won't Clog.

2. Use Good Equipment

Lakeside Engineering Co. has been building rotary distributors of high quality for 15 years. The two 78-ft. dia. Aero-filters originally installed at Lubbock in 1940 gave excellent service. And when the rapid growth of the city made it necessary to enlarge the plant last year two more Lakeside Aero-filters were installed. These were 84-ft. dia. and have 8-ft. rock depth. The four filters operate in parallel.

H. N. Roberts & Associates, engineers for the plant addition, called for a *specification* floor of *Vitrified Clay Filter Bottom Blocks* . . . the best kind of filter floor obtainable.



TRICKLING FILTER FLOOR INSTITUTE

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Texas Vitrified Pipe Co. Mineral Wells, Tex.
W. S. Dickey Clay Mfg. Co. Kansas City 6, Mo.
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NEXT MONTH . . .

PUBLIC WORKS Magazine will be devoted entirely to

CIVIL DEFENSE

Most important issue of PUBLIC WORKS ever published

None of us likes the implications behind the need for Civilian Defense. But the need . . . and the problems that grow out of it . . . are very real. Particularly to readers of PUBLIC WORKS.

Civil Defense is primarily an *engineering* job. It involves the use of construction equipment, transportation, housing, water supply, communications, refuse disposal, pest control, power . . . to name just a few.

Latest ideas on what to do

The need for helpful information is urgent. Yet our research shows little practical data is available from the normal sources. Therefore, we are devoting the April issue of PUBLIC WORKS entirely to Civil Defense . . . bringing you the latest ideas on what to do and how to proceed.

Order extra copies now

Everyone concerned with Civil Defense will want to read PUBLIC WORKS for April. Orders for many extra copies have already come in. The demand is sure to be great. But paper is hard to get and our print order is limited. We cannot guarantee to supply extra copies unless orders are received in advance. So don't wait. Order now any extra copies your community will need. Price: $1 each, money back if not more than pleased.
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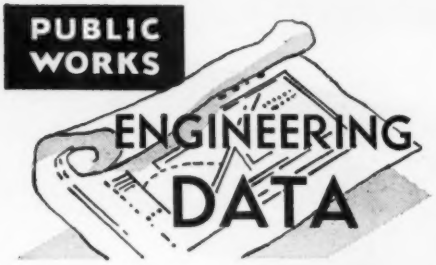

Air Tools Indispensable for Trenching

Walter Turner
Sup't., Water Department
Cambridge, Ohio

We have found air tools to be almost indispensable in connection with trenching of every kind. Paving breakers are used for cuts in brick and concrete; a lighter hammer is used for other hard surfaces; a spade is used for loosening earth in the trench; and the tamper for all places where backfill is necessary.

We also drill horizontal holes for installing small service lines by using an assortment of different drill lengths. This is a practical means of installing small diameter service lines in rock formation. The practice here is to lay the main on one side in the parking strip or tree lane, as it is sometimes called. We either push or drill to the opposite side.

Although we are just now purchasing a small ditcher (mounted on the rear of a Ford tractor) the air tools will continue to be our most valuable equipment.

Cost of Laying Water Pipe in 1949

The cost of laying water pipe in Hartford, Conn., during 1949, is given in the annual report for that year as follows, the cost not including overhead and trenching being by machine: 6-inch, based on 2,680 ft., total cost $3.466 per ft., of which $1.033 was labor, $2.332 was materials, and the remainder miscellaneous. For 8-inch, based on 35,914 ft., cost per foot was $4.603, of which $1.023 was for labor and $2.893 for materials. For 12-inch, based on 15,379 ft., total cost was $5.944 per foot, with labor amounting to $1.297 and materials to $4.632. The cost for 2,073 ft. of 16-in. averaged $8.203 per ft., with $1.707 for labor and $6.338 for materials.

Transparent Envelopes Trace Water Currents

Currents in lakes, rivers and bays are being tracked down more effectively and at less expense with postcards sealed in envelopes of Bakelite polyethylene instead of in glass bottles. Inserted in tubular sections of the transparent material with ends heat-sealed to prevent water penetration, the stamped postcards are dropped in the water at recorded points and times. A message on each card requests the finder to cut open the envelope, write in the time and place of finding and mail the card to the laboratory. In an Ohio survey, postcard returns were substantially greater from the durable floats, since they survive collisions with rocks and driftwood which sink many glass floats. Tracing currents with the envelopes is also considered more accurate because they float flat, out of reach of the wind which buffets the protruding necks of bottles and affects their destination along with the current.

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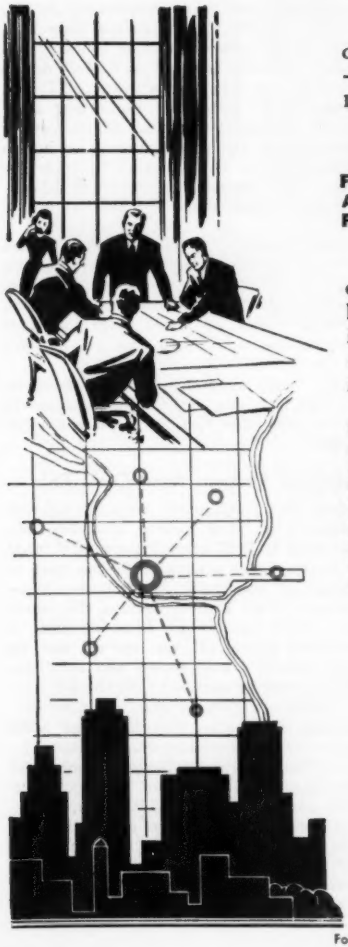

Years ahead in every phase of development of 2-way mobile radio communication for Public Safety Services, Transportation, and Industry —MOTOROLA HAS ALREADY SUPPLIED THE NATION WITH 'CIVIL DEFENSE' COMMUNICATIONS of a highly superior quality.

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84-HD Kettle using Hand Spray Attachment for Patch Work.

COST SAVER

When the Littleford 84-HD Kettle is on a road maintenance job its faster heating, efficiency in operation and patented features make it a Time Saver, Cost Saver and Road Saver. No other Kettle has ever been designed with such painstaking effort as the 84-HD. This Littleford unit has patented features such as Double Heat Circulation System, which utilizes the entire heat of the Burner, and Screened Reservoir, which assures a continuous flow of hot materials even when cold materials are added during the heating. These features are the reason why the 84-HD has repaired more Roads, Streets and Highways than any other kettle on the market. To make the 84-HD even more efficient, a Hand Spray or Motor Spray Attachment can be added to this Kettle.

ROAD SAVER

For further details see your nearest Littleford Equipment Distributor.

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LB LITTLEFORD

BLACK TOP ROAD MAINTENANCE EQUIPMENT SINCE - 1900

LITTLEFORD BROS., INC.
452 E. Pearl St., Cincinnati 2, Ohio

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Water Filter Reconstruction Costs

Two of the water filters serving Lewiston, Ida., were reconstructed last year. These filters were 24 ft. by 22 ft. 8 ins. The two other filters in service will also be reconstructed, as the mineral elements in the water have resulted in clogging and poor operation.

The gravel and underdrains were entirely removed; concrete piers were built to support the Aloxite porous plates which form the underdrain system. The piers, 2 ins. wide at the top and 6 ins. wide at the bottom, were fastened to the floor of the filter basin by pins cut from reinforcing steel and grouted into drilled holes with Mineralead compound. Everdur bolts were used to fasten the plates to the piers, and the plates were cemented together with Lumnite cement mortar, except at the walls where asphalt was used to permit expansion.

The total cost was $6,815.20 for the two filters, of which labor costs amounted to $2,634.59. The Aloxite plates cost $3,170, and other materials $1,010. The filters now wash perfectly and are in excellent shape, according to W. P. Hughes, City Engineer. The work was done entirely by water department employees.

Highway Construction Cost Trends

Price trend data have been maintained by the Bureau of Public Roads for the period since 1930, with the 1925-29 base prices set at an index of 100. The composite mile index is based on 1925-29 design and includes 17,491 cu. yds. of exacavation, 3,726 sq. yds. of paving, 16,000 pounds of reinforcing steel, 4,325 pounds of structural steel and 68 cu. yds. of structural concrete. In the cost figures given herein for the composite mile, no allowance is made for the increased design standards of Federal-Aid highways, and the same quantities are used as in the 1925-29 base.

For the third quarter of 1950, costs are reported as follows: For earth excavation 34 cents a cubic yard or 96.9 of the 1925-29 base; for concrete pavement $3.68 per sq. yd., or 165.9 of the base; for reinforcing steel, 10 cents a pound, or about twice the base; and for structural concrete, $44.66 a cu. yd., or 199.4 of the base.

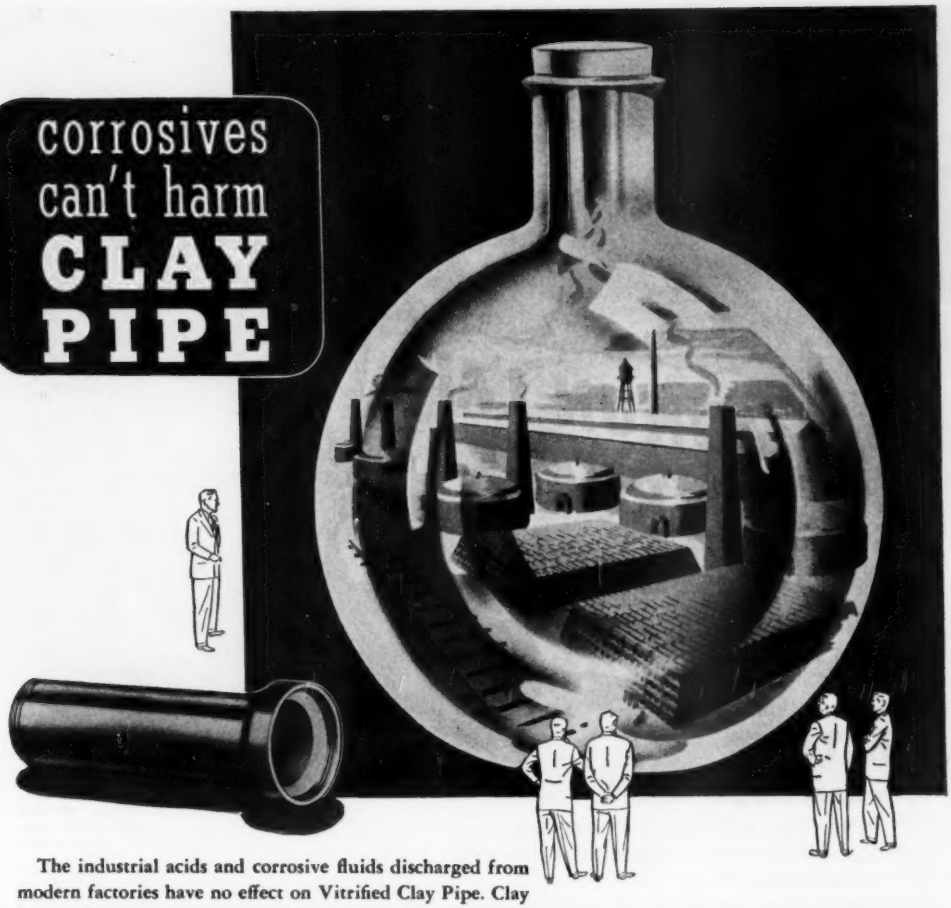
Third quarter costs show an increase of about 5% over the previous quarter, and an increase of about 20% over 1946. The cost peak occurred near the end of 1948.

New Equipment Reduces Road Costs 75%

Modern labor-saving equipment reduced highway operating expenses of Sand Prairie Township, Ill., about 75% last year. In 1948, graveling essential roads was done by contract at a price of $1.74 per yard of gravel. The total cost was $9,340. The township highway commissioner, Carl Fisher, decided this work could be done more cheaply by force account. A partially developed gravel pit was opened and an Allis-Chalmers HD-5G tracto-shovel and an Allis-Chalmers AD-4 motor grader were purchased.

During the summer of 1949, assistant commissioner Al Volk operated the tractor shovel, loading 5,368 cu. yds. of gravel into the township truck for application to the road. Costs were as follows: Gravel, 5,368 cu. yds., $671; gasoline and oil for the truck, 138 days, $690; fuel and oil for loader, $138; labor, $1,104; total $2,603. A credit of $209.50 was earned loading gravel for sale. Net cost of operating, excluding depreciation and interest, was $2,393.50, or 45 cents a yard of gravel applied to the roads. The savings almost paid for the new equipment.

corrosives can't harm CLAY PIPE



The industrial acids and corrosive fluids discharged from modern factories have no effect on Vitrified Clay Pipe. Clay is completely immune to any form of corrosive chemical activity, whether it's sewer gas, industrial waste, or the destructive acids found in sewage. Today, with chemistry involved in nearly half the nation's total production, it's more important than ever to install sewerage and drainage lines that are chemically inert — proof against the acids and soil conditions of today . . . and of tomorrow. *Every* city of *every* size needs Vitrified Clay Pipe — the *only* pipe that never wears out.

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SPECIFY *Vitrified* **CLAY PIPE**

WRITE FOR DETAILED INFORMATION

Additional information and data on Vitrified Clay Pipe, Wall Coping and Clay Flue Lining sent FREE on request. State your specific questions. Simply contact the regional office nearest you.

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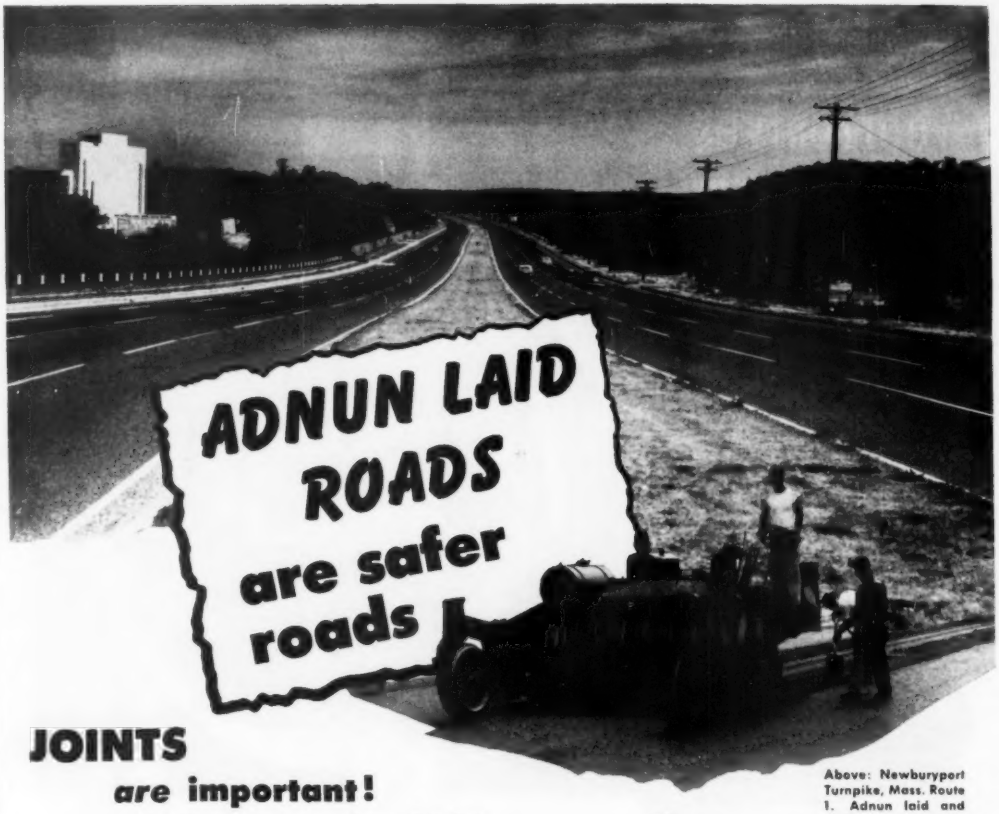

JOINTS *are* important!

IN this day of the increased use of asphalt on high-speed, multi-lane roads, tight, smooth joints mean safer roads.

The Adnun is the only black top paver that makes a tight joint automatically. The oscillating overlapping Cutter Bar carries the material up against the parallel course or curb and compacts it in place. It is not dependent on the eye or human judgment. It is level, tight and positive—a safe joint that will not throw a car off its course or leave thinner spots where breakdown can begin.

This is only one of the many Adnun advantages that has been responsible for the long life of heavily traveled Adnun laid roads. If you don't have them ask for the booklets "Roads That Last" or "11 Basic Things . . ." They tell an interesting story.

THE FOOTE COMPANY, INC.
Subsidiary of Blaw-Knox Co.
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Above: Newburyport Turnpike, Mass. Route 1. Adnun laid and traffic loaded since 1936, 15 years ago.

Lower: Joints are going to be tight and safe on this three lane job.

Above: Only overlapping Cutter Bar action can produce a joint like this. No raking or hand work is necessary.

ADNUN TRADE MARK REGISTERED **BLACK TOP PAVER**

A BLAW-KNOX PRODUCT

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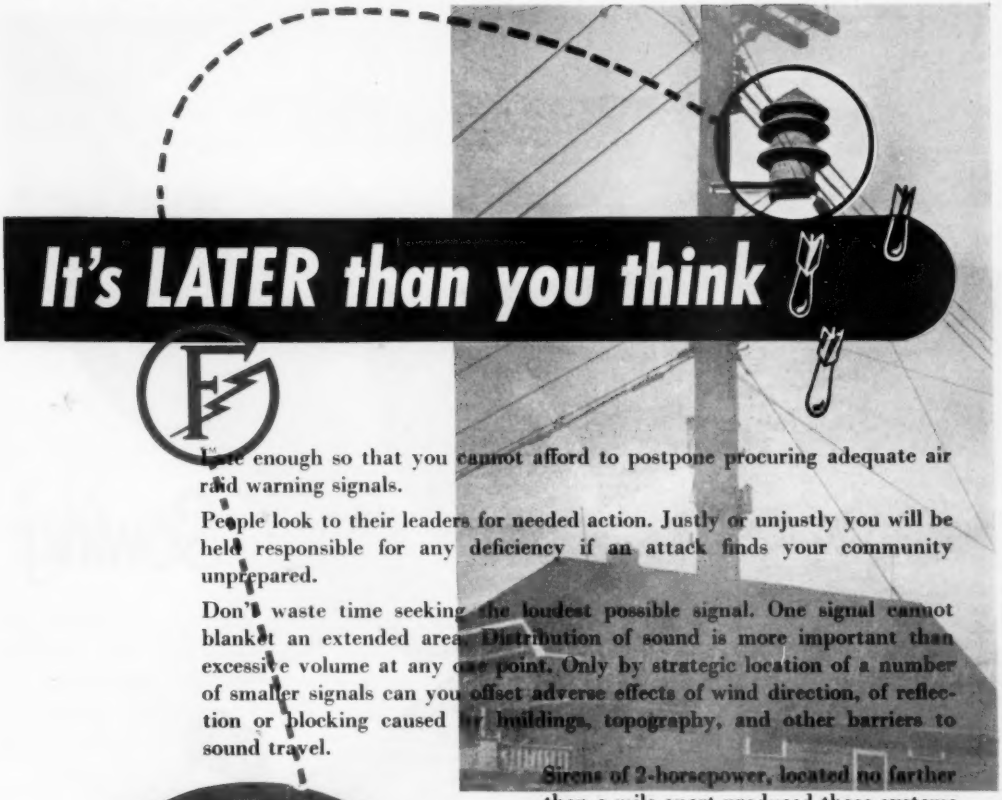
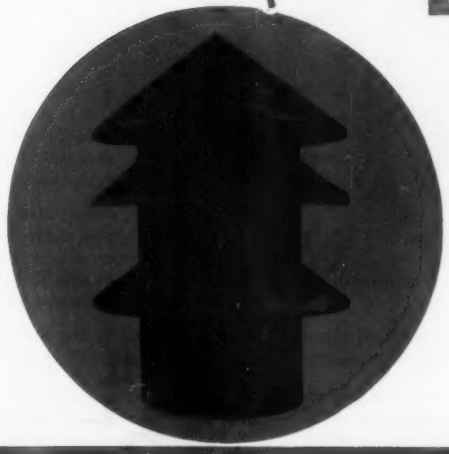


It's LATER than you think

late enough so that you cannot afford to postpone procuring adequate air raid warning signals.

People look to their leaders for needed action. Justly or unjustly you will be held responsible for any deficiency if an attack finds your community unprepared.

Don't waste time seeking the loudest possible signal. One signal cannot blanket an extended area. Distribution of sound is more important than excessive volume at any one point. Only by strategic location of a number of smaller signals can you offset adverse effects of wind direction, of reflection or blocking caused by buildings, topography, and other barriers to sound travel.



Sirens of 2-horsepower, located no farther than a mile apart produced those systems pronounced most effective in World War II. Federal 2-hp. sirens are economical in first cost, require no maintenance, and weighing but 65 pounds, can be installed with a minimum of material and labor.

Save **TIME!**
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JOHNS-MANVILLE JM PRODUCTS

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tax savings for the future

Three billion, two hundred and fifty million dollars*—that's what it will take to foot the bill for new water system construction so urgently needed by the American people during the next ten years!

For the thousands of communities that must carry a share of this additional investment, the vital need for water system expansion is most unwelcome at this time in the face of constantly rising costs.

This means that, wherever possible, water works officials will be called upon to keep an exceptionally close watch on expenditures . . . to see that the money laid out for new systems brings the greatest possible return to the taxpayer.

Since a sizable part of the cost of any water system involves the supply and distribution lines, an important question to be answered by these officials will be: "Which pipe will give the greatest return from this portion of our investment?"

Thousands of communities have already found the answer to this question in Transite Pressure Pipe.

A threefold warranty of economy is built into every length of Transite Pressure Pipe . . . the modern pipe developed by Johns-Manville through research and engineering to carry water more efficiently:

1. ***Long service life*** . . . because Transite Pipe is made of three inherently corrosion-resistant materials—asbestos, cement and silica—and is steam cured under pressure by a special Johns-Manville process which assures *maintained strength in service.* Carefully kept records of performance in highly corrosive soils prove that conditions which seriously weaken other pipe materials have little effect on Transite.

2. ***Low operating costs*** . . . because Transite Pipe has a smooth interior surface which provides a high water-carrying capacity (C=140). Moreover, because Transite cannot tuberculate, this high carrying capacity *remains* high through the years. Pumping costs, as a result, stay low. Delivery of a full volume of water at lowest operating cost is assured.

3. ***Maximum water economies*** . . . because Transite Pipe has tight, yet flexible joints that *stay* tight in service. These joints absorb vibration and soil stresses, cut down on costly underground water leakage. This is especially important today when water supplies in many localities must be conserved to the limit to meet constantly increasing water consumption.

In addition to these assurances of tax savings for the future, Transite Pressure Pipe offers many *immediate* economies, such as important savings in time and money during installation . . . further sound reasons why it will pay you and your community to specify Transite for the greatest return from your pipe investment.

*From THE WALL STREET JOURNAL, May 26, 1950

For complete information write Johns-Manville, Box 290, New York 16, N. Y.

TRANSITE PRESSURE PIPE

Transite is a registered Johns-Manville trade mark

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Year 'round Roustabout

PAYLOADERS SERVE IN EVERY SEASON

Cities, towns, counties and states have bought "PAYLOADERS" on the basis of performance, on their ability to do *more* jobs and do them better than other tractor-shovels. "PAYLOADER" superiority accrues from The Frank G. Hough Co.'s conviction that an effective tractor shovel requires SINGLE-UNIT DESIGN. Tractor and shovel should be built *together* rather than as a shovel attachment for a standard tractor. "PAYLOADERS" have the advantage of being *built for the type of work they perform.*

Multiple reverse speeds, proper weight distribution, correct tire sizes, short compact design and operator location for full visibility are but a few of the desirable features that "PAYLOADER" unit-design offers.

Maximum versatility for all sorts of digging, grading, loading, pushing, pulling and lifting work is built into "PAYLOADERS" . . . plus the ability to get to the job at speeds up to 20 miles per hour. There is a complete line of five sizes from which to choose from 12 cu. ft. up to 1½ cu. yds. bucket capacity. The Frank G. Hough Co., 761 Sunnyside Avenue, Libertyville, Illinois.

JOB STUDY No. 19

is an illustrated fact-filled report on how one town uses "PAYLOADERS". It's available on request and without obligation.

SAY "HUFF"

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THE FRANK G. HOUGH CO. • Since 1920

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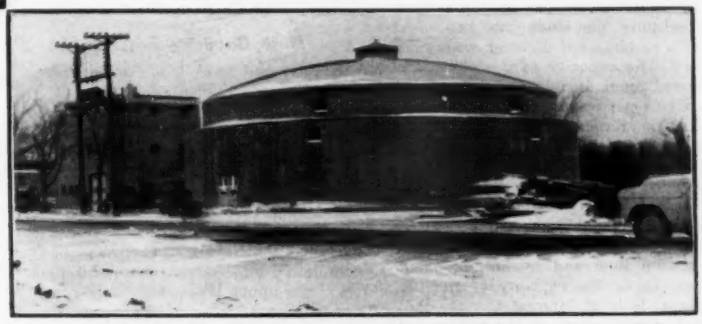
PUBLIC WORKS Magazine

MARCH, 1951 VOLUME 82 • No. 3



• *COVERED tile filter in foreground; control house at rear left.*

ADDITIONS QUADRUPLE SEWAGE PLANT CAPACITY

M. E. BOYDEN

City Engineer, Moorhead, Minn.

RANDOLPH L. SMITH

Consulting Engineer, St. Paul, Minn.

A COMPLETE waste treatment plant, based on a flow of 800,000 gallons per day of sewage with a BOD of 500 ppm, was built by Moorhead, Minn., in 1934. Actual measurements in 1945 indicated flows up to 1,300,000 gallons per day with a BOD strength of about 500. This is more than twice the design capacity of the plant.

Moorhead is just across the Red River of the North from Fargo, North Dakota. Because of the geographical position of Moorhead in relation to North Dakota as a marketing area and because of the excellent farming land in the neighborhood, the population of Moorhead and its industries have progressed at a rate far in excess of normal growth. This increase is reflected in the waste disposal problem.. The industrial wastes are primarily from milk and poultry processing.

Tests on the existing plant indicated that it was doing an excellent job— much better than the average plant. The raw waste was about 500 ppm BOD with a final product of about 75 ppm BOD. Fargo has two waste treament plants, one for the City and one for a meat packing plant. Information indicated that the city plant was producing an effluent of about 70 and the meat packing plant a final product of about 50 ppm BOD. Data from the U. S. Engineers indicated that the flow in the Red River was at zero approximately 10 percent of the time during the period of 1924-1936. The history of the Red River of the North as to extremely low water or flood conditions is not comparable with most other rivers, as the extremes are too marked. The analysis of the existing treatment plant indicated that reasonably good treatment could be obtained for another two years and then a gradual breakdown in treatment would occur.

Improvements Planned

In the latter part of 1949, the City Council authorized the construction of extensive additions to the old waste treatment plant. This au-

thorization of an expenditure of over $500,000 is a tribute to the progressive attitude of the Council in maintaining the waste treatment facilities of the City at maximum efficiency. Included in this article is a drawing showing the old plant in dash lines and the new additions to the plant in solid lines. The photo shows the exterior of the larger of the new units, the high capacity tile filter and the control house.

Bases of Design

The original plant included a round mechanized settling tank with a large fixed nozzle type, low capacity, filter and an unmechanized final tank. The sludge was processed in a mechanized digester with sand bed. The capacity of the plant was based upon an average flow of 625 gallons per minute, with an equivalent population of about 11,000 people. The new plant is based upon maximum flow condition of 2,200 gallons per minute, with a population of about 18,000 people, plus equivalent population as industrial waste of 26,000 people. This increased flow and loading is about four times the capacity of the old plant. It is of interest to note that the actual cost of the additional units in the four-fold increase in plant capacity just about equalled the cost of the original plant with allowance for the rise in prices during the intervening years.

The general method chosen to produce a condition wherein the old units of the treatment plant were to remain usable and treatment could be provided for a four-fold increase in loading is the two stage biological filter. A new tile media high capacity filter was constructed and minor alterations were made to the old fixed nozzle low capacity filter to permit of very high flow loadings with a reduction in the organic material loading.

The Treatment Plant

The existing plant included a pumping station about 3100 feet from the treatment plant. As the city sewer system is of the combined type, it was necessary to add mechanical coarse screening and grit removal in addition to the replacement of the pumps with larger units. As the main from the pumping station to the treatment plant is only 14-in., it will be necessary to add an additional line in the future to reduce the pumping load.

The first unit in the treatment process is a self-cleaning fine screen of the North type. The choice of this unit is based upon four considerations: first, the potential anerobic inoculum in the long 14-in. force main from the pumping station to the plant; second, the tendency for the waste to become septic in the large city sewers during dry weather conditions; third, the presence of such a high percentage of milk and blood wastes in the sewage to be treated; and fourth, the saving in costs by the use of a fine screen. The fine screen was so placed that the discharge from the long force main could flow by gravity to the first filter, thus eliminating an extra pumping station.

High Capacity Filter

The second unit is the high capacity tile media filter. This unit was placed approximately ten feet above the ground to permit of the construction underneath of a city storage room for equipment and also to permit of gravity flow to all the units. The city storage room is round and approximately one hundred feet in diameter. The filter is completely housed and is accessible from the upper level of the control house. The housing of the filter is necessary because of the need of protection of the microbial life during winter, better fly control, elimination of odor and better appearance. The media in the filter is prefabricated of vitrified clay. The use of this material was based upon economy by the use of high loading, better odor control, longer life, elimination of ponding, etc. The filter is 84 ft. in diameter and 6 ft. deep, with a capacity of 3 mgd of sewage.

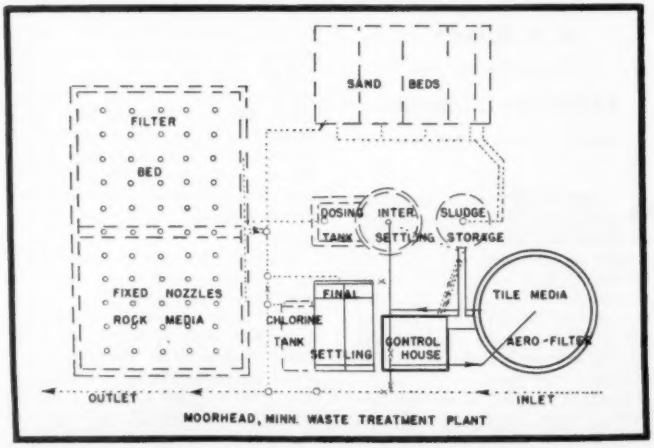
The third unit is the intermediate settling tank. This tank is a round unit of standard design and, with the exception of providing a new housing structure, is as used with the original plant.

The fourth unit is the old fixed nozzle filter designed to process 900,000 gallons per day with a BOD of 250. Minor changes in hydraulics will permit this unit to pass 2200 gpm in terms of flow. The BOD of the waste reaching this filter will be reduced from 500 to less than 90, implying that the load, in terms of organic material, will be reduced to less than the original design load.

The fifth unit is the final settling tank. This unit is entirely new and is designed upon the basis of future maximum flow conditions. The tank is of the rectangular type of standard design.

The old separate sludge digester has a capacity equal only to about one-third of the actual capacity needed. The digester is altered to become a sludge storage tank in place of a digester and a vacuum filter is provided in place of additional sludge storage capacity. This is based upon two considerations: first, the very material savings in cost effected; and second, the extreme flexibility permitted in a community that is expanding at a very rapid rate.

The control house includes the fine screen, the vacuum filter, gas burning equipment with oil standby, garage room, office, sanitary facilities, lime and ferric chloride storage rooms and work room.



● ***NEW plant shown in solid lines; the old plant in broken lines.***

● ***SECTION of new 4-lane highway, 13 miles long, between Rio Piedras and Caguas, Puerto Rico.***

4-LANE HIGHWAY FOR PUERTO RICO

● ***PAVING mixer is placing concrete on new 4-lane highway.***

PUERTO RICO, which already has 2,000 miles of paved roads to boast the best highway system in the Caribbean, has embarked on a vast program for expanding and improving its road network at a cost of $30,000,000. In addition to new routes, present highways will be widened and resurfaced, and through traffic will be speeded by cutoffs which circle the more heavily populated communities.

Although Puerto Rico is a small island, only about 100 miles long and 35 miles wide, it presents difficult road construction problems because of mountainous terrain in most of the interior. Yet several good roads cut through the mountains to link the northern and southern coastal cities, as well as covering most of the island's circumference. These are highly important because most freight is moved by road, while the recent influx of tourists has made first class roads in all parts of the island especially urgent.

One of Puerto Rico's principal highways is a four-lane asphalt road from the capital city of San Juan to the northwestern end of the island. Part of an $8,000,000 highway construction job, it was built by the United States government in 1941 to carry military personnel and supplies to the Army Air Base at Borinquen Field. Now it is Puerto Rico's main peacetime highway, and ranks among the best in the Caribbean area. Improvements were recently made in sections of the road from Isabella through Aguadilla to Aguada.

Despite this progress in road construction to date, Puerto Rico has drawn up an ambitious long range plan to spend some $30,000,000 for new construction and repairs. The first new link in this program will be a limited access highway connecting Rio Piedras, on the outskirts of San Juan, with Caguas, largest mid-island city about 13 miles away. It will be concrete surfaced, with two lanes in each direction separated by a dividing median, and will cost about $5,000,000 to complete. The initial two and a half mile stretch, beginning at Rio Piedras, was recently completed and opened to traffic.

Further links will soon be added to provide a through traffic route out of San Juan to the interior by way of Caguas, which is the focal point of most traffic to communities on the south coast of the island. Since it is one of the most heavily traveled routes in Puerto Rico, a modern highway is a necessity.

Several other express highways have been completed or are on the drafting boards. One is the Eleanor Roosevelt Highway which runs from San Juan to the giant low-cost housing project outside the city at Puerto Nuevo. Another is contemplated to connect the capital with the International Air Terminal which is being constructed east of San Juan at Isla Verde.

The Rio Piedras-Caguas highway and other roads on the island are being constructed under the supervision of the Department of the Interior, using private contractors. The Department now has 52 miles of primary, secondary and urban roads under construction, with another 82 miles of new roads scheduled for early completion. This is modest mileage by mainland standards, but represents major progress in the development of Puerto Rico's internal transportation system.

The long range $30,000,000 highway construction program will be carried out principally with the island's own finances, supplemented by some Federal aid. In line with the Puerto Rican "pay as you go" policy, no special bond issues for highway construction are involved, and virtually all Insular money for this program comes from the general tax fund.

One Side Parking

HENRY LIEBMAN
Director of Operations
Department of Sanitation, New York City

THE bane of the Sanitationman's existence is parked cars. This problem, especially in large cities, is becoming more and more acute due to the increasing number of cars and trucks, the narrow streets, the lack of garage space, inadequate offstreet parking and loading facilities and a growing disregard of traffic laws and regulations. These conditions prevent the use of mechanical street sweepers, necessitating employment of arduous hand labor to sweep the streets and clean underneath parked vehicles. Besides hindering street cleaning, efficient garbage collection and prompt snow removal are hampered. The presence of these parked cars encourages littering of the streets by thoughtless persons who discard paper and other material between and underneath the parked cars.

The Department of Sanitation of the City of New York finally determined to inaugurate a large-scale experiment in restricting parking for the purpose of cleaning streets. Selecting one of the worst areas in the city, from both the standpoint of sanitation and the density of parked cars, namely, the lower east side of Manhattan, a restricted parking scheme was initiated on August 1, 1950.

This area, part of Sanitation District #4, extends from Houston Street to 14th Street and from Lafayette Street and 4th Avenue east to the East River Drive. A series of conferences were held by the officials of the Police, Traffic, Welfare and Sanitation Departments at which the regulations, operations, erection of signs and stanchions, assignments of police and special labor forces were worked out.

The Plan for the Test

In this ninety-block area the following restrictions were adopted: Daily between the hours of 7 A.M. and 3 P.M., with the exception of Sunday, no parking was permitted on the north side of the numbered streets and the west side of the avenues on Monday, Wednesday and Friday; and no parking was permitted on the south side of the numbered streets and the east side of the avenues on Tuesday, Thursday and Saturday. In order that the public might be notified of the proposed regulations, 115 relief recipients from the Department of Welfare were employed as street parking wardens. These men, who worked part-time, were assigned under a Sanitation officer to inform car operators of the new parking restrictions in the area. They were briefed in their duties at the Sanitation Training Center in Brooklyn prior to their assignment. They were granted no police powers. One thousand five hundred signs containing the new parking restrictions were posted on all the avenues and streets in the area. Press releases were sent to all newspapers and radio stations, both of whom cooperated magnificently.

● ***RESTRICTED parking permits 200 ft. of gutter on one side of street to be swept in approximately 30 seconds.***

The Police Department arranged for extra patrolmen to enforce parking regulations and to tag those cars illegally parked. Vehicles so tagged were removed by Sanitation wreckers to a car pound at Pier #70, 22nd Street and the East River. In a further attempt to clean up this area, 325 additional wire baskets for litter were placed on the streets making a total of 505 baskets.

The Department's plan for cleaning operations in this area consisted of flushing the streets daily, collecting the litter from the wire baskets, mechanically sweeping the streets on the free side twice daily and using manual sweepers for picking litter on the side where cars were permitted to park. Household refuse collection was maintained according to usual daily schedules. Wreckers were assigned for the purpose of hauling illegally parked vehicles to the car pound. On August 1, 1950, thirty cars were impounded and in this area since the inauguration of the program to Dec. 8, 828 cars have been impounded. Any car tagged in this area is tagged with a green police tag signifying that the recipient is liable to a $15 parking penalty. In addition, a $10 towing charge is imposed by the Department of Sanitation before the owner can reclaim his vehicle. In several cases the cars which were removed were of so little value that the owners have not bothered to reclaim their vehicles. These cars will be eventually sold at auction.

Results of the Test

The results of the test operation proved highly successful from the first day. Streets that were formerly littered and dirty immediately presented a clean appearance. The old practice of illegally dumping refuse in the streets by many householders has been practically eliminated. There is no doubt that this operation has brought a radical change in the habits of many of the people

Aids Street Cleaning

residing in this area. Many favorable comments have been received from the press, the residents and observers. In addition, the marked success has not only allowed the Department to reduce the amount of personnel and the number of pieces of equipment assigned, but we have also been able to reduce the frequency of machine sweeping from twice daily to once daily, and have recommended the reduction of the restricted hours of parking from 7 A.M.-3 P.M. to 7 A.M.-12 noon. Insofar as personnel is concerned, previously 28 sweepers were required to clean this area and today the same job is done by 15 sweepers and two machine brooms.

The excellent results encountered right from the start convinced the Department that it was on the right track and plans were made for the extension of the parking restrictions to the remaining two sections of Sanitation District #4. These two sections, namely 10 and 11, comprise the area bounded by Houston Street, Delancey Street, 4th Avenue and the East River. The regulations promulgated in this area and the plan of operation are identical to those employed in Sections 12 and 13. The hours of restriction are from 7 A.M. to 12 noon. Again 191 litter baskets were added to the then existing baskets making a total of 239; and 1,110 parking signs were erected on poles and stanchions; forty-four street parking wardens were assigned.

Impounding Cars

The regulations became effective on November 20th. Seventeen cars were taken to the car pound on the first day and up to date a total of 121 have been impounded. From the beginning the results were gratifying. On streets, such as Orchard and Ludlow, which were the dirtiest streets in the City of New York, the results were remarkable.

The plan in operation in Sanitation District #4 has enabled us to reduce by seventeen the number of men employed in this district before the plan was put into effect. These men have been transferred to other locations where they are sorely needed. Sanitation District #4 contains a population of about 150,000, has 38 curb miles of streets within an area of paved streets of 810,000 square yards. The annual output of garbage and rubbish is approximately 50,000 tons and the ash output approximately 25,000 tons.

Sanitation inspectors were assigned to this area to issue summonses to all persons violating the Sanitary Code, such as littering streets, use of improper receptacles, throwouts and other violations.

The success of this plan in District #4 has convinced this Department that the program should be extended to other areas of the city. In the near future selected districts in other boroughs will be included. The cooperation of the car owners has been good, probably to a large degree because of the certainty that if a car were parked illegally it would be towed off by the Department wreckers.

In addition to the improvement in street conditions, the partial restrictions in this area have helped considerably in the movement of traffic; commercial deliveries can be scheduled better and all traffic speeded up considerably. Bus operators report that they have been enabled to maintain schedules.

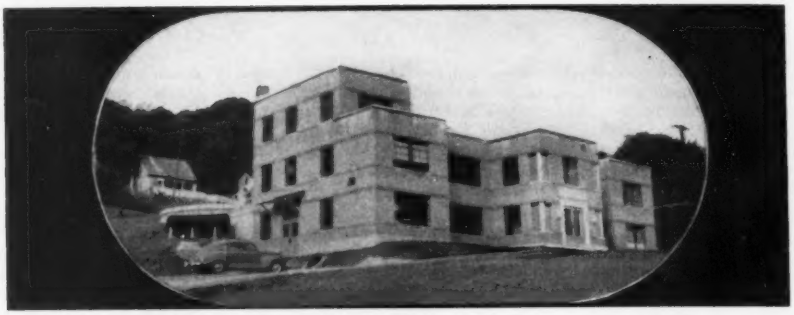
The city has just purchased twenty large dual-control Wayne mechanical brooms of three-cubic yard hopper capacity and fourteen new F.W.D. wreckers for this work.

The Department of Sanitation is headed by Commissioner Andrew W. Mulrain. This program is being carried out under the supervision of the author, who is Director of Operations, with the cooperation of the Department of Traffic headed by Commissioner Lloyd B. Reid and the Police Department under the jurisdiction of Commissioner Thomas F. Murphy. Public Relations work was handled by John S. Wagner, Public Relations Advisor of the Department of Sanitation.

● ***LONE violator impedes the cleaning program seriously.***

● ***REMOVING parked car to permit cleaning littered area.***

● ***STREETS that have been dirty for years can be swept clean under the new one-side, alternate-day, parking regulation.***



● *FRONT VIEW of Chester's new water treatment plant.*

UNUSUAL FLEXIBILITY

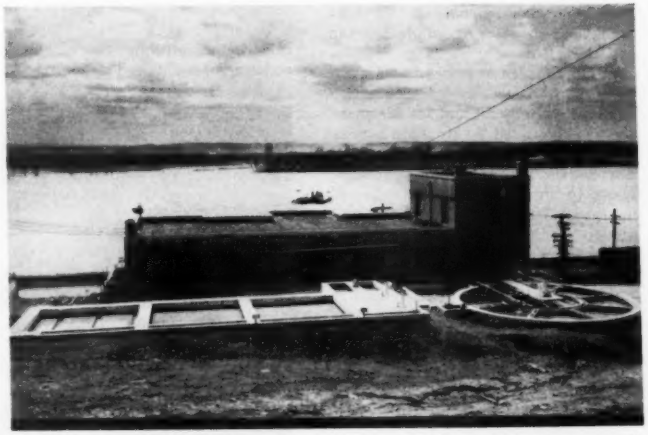
F. E. WENGER,

Russell & Axon, Consulting Engineers

FOLLOWING recurring water shortages due to an inadequate water treatment plant, Chester, Ill., a city of 7,500 population, in March, 1946, retained the services of Russell & Axon, Consulting Engineers, to make an overall study of the water needs of the City and to prepare detailed plans and specifications based on this overall study.

A study of the existing 0.4 mgd filtration plant indicated that it was so constructed that it did not readily lend itself to expansion and, further, that expansion of the plant would not be economical. In addition, it was learned that the Missouri Pacific Railroad was considering relocating its tracks in order to get above the flood waters of the Mississippi, and the only feasible relocation would be through the site of the existing water plant. Because of these two conditions it was determined that it would be best to abandon the old plant and to construct a new plant of adequate capacity on a site away from any possible encroachment by the railroad.

These conditions were discussed in detail with the city officials and the decision was reached to predicate all future studies on the basis of constructing a new plant on a site directly east of the existing filtration plant. Sufficient land was owned by the City and the existing intake structure in the Mississippi River could be utilized with but little change. Maximum economies would be effected by selection of this location and all possible economies were necessary in order to construct a plant of adequate capacity within the financial limitations of the city.



● *PLANT from land side, with treatment equipment in foreground.*

The city had imposed a limit on the financing and indicated that the entire program was to be financed by the issuance of water revenue bonds. Past records of the operation of the water works were studied in detail to determine the amount of revenue bonds which could be sold. These studies indicated that approximately $360,000 would be available to cover the entire cost of the project.

From preliminary studies it was determined that a plant having a rated capacity of 2 mgd was necessary to meet the anticipated future demands of the city and the requirements of the fire underwriters. These studies further indicated that by using the existing raw water intake in the Mississippi River, the project could probably be constructed within the funds available. These preliminary studies were presented to the City and were approved and authorization was received to prepare detailed construction plans and specifications.

The existing intake had proven satisfactory since the last reconstruction in 1941. The station is of the dry-pit type having two suction

lines, one 8-inch and one 6-inch, laid on the bed of the river and terminating in a header in the structure. It was decided that this structure would be used and only those changes necessary to fit it into the new plant would be made. These changes consisted of the installation of two horizontal centrifugal raw water pumps, one having a capacity of 1400 gpm and the other a capacity of 1050 gpm. All piping was changed to fit these pumps. The existing piping and pumps were removed and the old pump retained as standby.

The records by both the State Department of Health and the Chester Water Works of the raw Mississippi River water indicated an extreme variation in raw water characteristics. Not only did the turbidity of the raw water vary from 300 to 4,000 ppm, but there was also a variation in the nature of this turbidity. Part of it was in colloidal form, this at times accounting for as much as 80% of the total. Therefore, considerable thought was given to the design and selection of equipment (1) to provide adequate clarification; (2) for securing the economies necessary in construction costs; (3) for assuring flexibility from the standpoint of operational procedure; (4) to effect economies in chemical consumption; and (5) to provide standby service.

As a result of these studies, a decision was made to provide a preliminary sedimentation basin with a retention time of two hours. A mixing chamber was located on the inlet of this basin. The primary purpose of this basin was to provide plain sedimentation without coagulation in order to effect savings in chemicals during periods of high turbidity by the removal of turbidity not in colloidal form. The addition of the mixing chamber, however, makes it possible to use this part of the plant as a clarification unit during any emergency that might occur due to temporary outage of the main clarifying unit. A rapid sludge recirculating type unit was selected for clarification and softening of the water previous to application on the filters. This equipment was installed on a concrete structure 30 feet in diameter by 14 ft. 9 inches total depth. This unit provided a retention time of 53 minutes and a guaranteed capacity rate of 1400 gpm. The piping, raw water and chemical, to the above two units, was arranged in such a manner as to provide the following flexibility of operation:

1. Series operation, using the presedimentation basin to remove some of the turbidity without the use of chemicals.

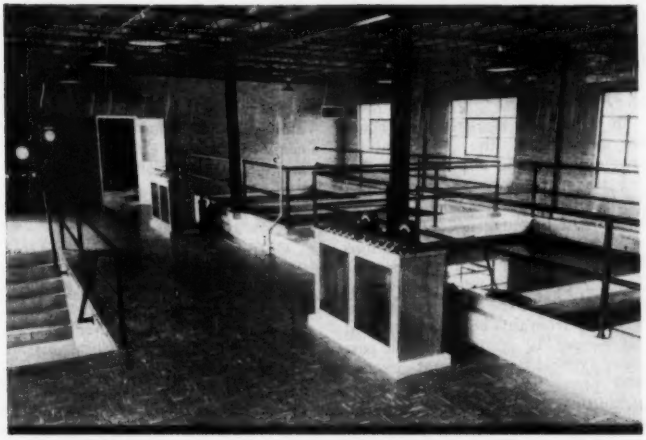
2. Series operation, by adding lime in the mixing chamber of the presedimentation basin for softening and to aid the preliminary sedimentation.

3. By-passing the presedimentation basin and providing raw water flow directly to the final clarifying and softening unit.

4. Raw water flowing to the presedimentation basin, where lime, coagulant, and activated silica can be added at the mixing chamber for complete treatment when the main unit is out of service.

This design provides for unusual flexibility in operation to meet any raw water condition of the Mississippi River or to meet any emergency which may require stand-by equipment.

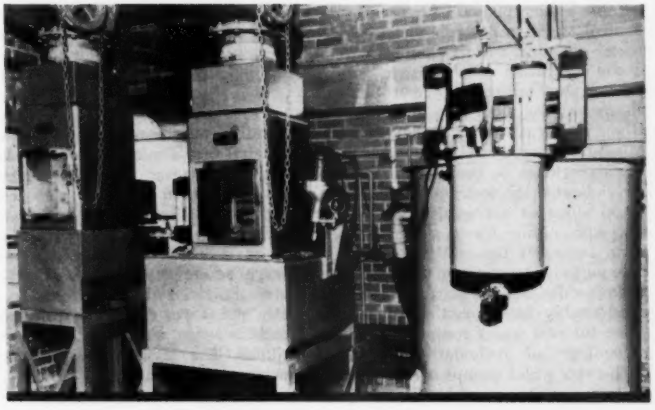
FEATURES WATER PLANT



● ***Filter room and chemical feeders at the Chester plant.***

Recarbonation

Recarbonation is required to produce a stable water. The recarbonation basin was designed to be integral with and at the outlet of the clarifier softening structure. A retention time of 10 minutes was pro-



vided in this structure. The structure was designed with the conventional distribution grid of wrought iron installed at the bottom of the basin. The recarbonation equipment consists of a 30-inch diameter scrubber, containing lime stone; a centrifugal compressor taking its suction from the scrubber; and a dryer and gas flow manometer on the discharge of the grid. Gases of combustion are furnished by an oil fired, water cooled furnace. The equipment has a capacity for delivering 500 pounds of CO_2 per 20 hours based on 9 percent CO_2 in the combustion gases.

Filters and Chemical Feeds

Four gravity filters handle the rated capacity of 2.0 mgd at a filter rate of 2 gallons per square foot per minute. These filters are equipped with Transite underdrains and steel wash troughs. The filter media consists of 27 inches of anthrafilt and 14 inches of graded gravel. Two operating tables are provided, each table operating two filters. All filters are equipped with rate-of-flow and loss of head gauges mounted on the operating tables.

All plant piping was designed so that plant capacity could be increased to 3 mgd if this became necessary in the future.

Three chemical feeders are provided, one dry lime feeder with a capacity of 225 pounds per hour; one coagulant feeder with a capacity of 192 pounds per hour; and one activated silica feeder, capable of a maximum dosage of 10 ppm, for preparation and feeding of activated silica solution. In order to provide flexibility in the use of coagulants, the coagulant feeder was designed for either alum or ferric sulphate. This required a dilution chamber with motor agitator and rotameter on the water make-up for accurate control so as to provide the proper water-chemical ratio to assure adequate hydration of the ferric sulphate. Our survey of raw water characteristics along the Mississippi River below the confluence of the Missouri River, as well as our previous experience in treating this water, indicated the desirability of activated silica as a coagulant aid. Its use with either ferric sulphate or alum increases the settling rate of floc particles, compacts the sludge and provides better coagulation with considerably less coagulant dosage when the raw water contains a high percentage of colloidal turbidity.

The raw water pumps are of such capacity as to provide flexibility of the water processing rate. In the interest of uniformity of treatment and simplicity of control, automatic proportioning of chemicals was deemed very desirable. For this reason an orifice plate was placed in the raw water line to provide differential for an electric meter which transmits variable time impulses electrically to each of the chemical feeders so that regardless of the raw water flow chemical dosages remain constant. A basin level control device in the raw water inlet line permits a uniform basin level to be maintained regardless of the flow. Filter rate controller shut off devices, controlled from the filter level, make possible the operation of the plant at any desired flow up to capacity by the simple operation of starting the raw water pump of the capacity required by the high service water demand.

The chlorinators in the existing plant were found to be in excellent condition and of adequate capacity. The designs provided for the use of this equipment in the new plant for pre- and post-chlorination.

Specification Requirements

In order that responsibility could be centralized, the specifications provided that the clarifier unit, filter underdrains, rate controllers, filter gauges, and chemical feeding equipment be furnished by a single manufacturer. The specifications further provided that the manufacturer of the clarifier equipment guarantee that the average effluent turbidity from this equipment would not exceed 10 ppm when the raw water turbidities did not exceed 2500 ppm; and when raw water turbidities exceeded 2500 ppm the average effluent turbidity would not exceed 25 ppm. The guarantee further provided that after recarbonation and filtration the total hardness of the water could not exceed (as calcium carbonate) 60 ppm and further that the water would be stable.

Storage

Studies of storage requirements indicated that a minimum of 500,000 gallons storage in addition to the existing 100,000 gallons elevated storage would be necessary to meet the fire underwriter's requirements. It was deemed desirable that all storage be elevated. However, estimates indicated that this was too costly and it was decided to provide ground storage with booster pump facilities. The ground storage tank was constructed of steel set in a concrete ring wall on a sand cushion. The ground storage tank was located immediately adjacent to the existing elevated tank. The high service pump units, which are lolocated in the filter plant, were designed to pump through the distribution system into the elevated tank and also into the ground storage tank. Piping and controls were so arranged that the entire flow was directed into the elevated tank until the overflow level was reached. After this the flow was directed into the ground storage tank. The ground storage tank was equipped with automatic controls to prevent overflow and to shut off automatically the high service pumping units. The booster station, immediately adjacent to the ground storage tank, houses two 500 gpm pumps, one of which is driven by electric motor and the other by dual-drive electric motor and gasoline engine. These pumps are automatically controlled by the water level in the elevated tank and the controls are set so that the elevated tank will be kept full at all times.

Doing the Work

The detailed construction plans and specifications were approved early in 1948. An election to authorize the issuance of revenue bonds was carried by an approximate majority of two to one. Bids were received in August, 1948.

Only two bids were received for the construction of the entire improvement. One bid was a firm bid and was approximately 15% above available funds. The other was an offer to construct for actual overall cost plus 15% profit. Both bids were rejected and the City invited the two bidders to negotiate a contract. The reason more bids and better bids had not been received was due to the fact that it was practically impossible for contractors to obtain firm commitment from suppliers of pipe and equipment; and there were also considerable fluctuations in the labor market at this time. These conditions indicated that difficulty would be encountered in satisfactorily concluding negotiations within funds available.

Negotiations were carried on with the two low bidders from September 1 through October 15. Some minor changes effecting economies were made in the general plan and by means of these changes it was possible to complete a negotiation with the Thos. J. Sheehan Company of St. Louis, and a formal contract was entered into with this company

(Continued on page 86)

● *PACIFIC Ocean on the right. Construction of highway across sand-spit is being carried on.*

UNUSUAL CONSTRUCTION PROBLEM

● *COMPLETED 220-foot high cut showing step-backs to reduce possibility of bank slippage.*

ON SAND-SPIT HIGHWAY

MARK McMILLIN

RECENTLY completed at a cost of slightly more than a million dollars, the four-mile unit of the Redwood Highway (U.S. 101), 40 miles north of Eureka, posed some interesting problems for California State Highway engineers and for the contractors, the Piombo Construction Company of San Francisco.

The project involved realignment of a section of the highway leading across a sandspit 4500 feet along the ocean front, some 800,000 cubic yards of excavation, the construction of embankments across marshy ground, the stripping of unsuitable material from large areas, the stabilization of fill foundations, and, finally, the unexpected discovery of an old Indian burial ground, which had to be removed after permission was granted by surviving members of the tribe.

This road serves two important purposes. 1) It is the only direct coastal route from Central California into the Crescent City area on the Coast. And 2) it passes through a large area devoted to logging and lumbering operations, and as a consequence the road is continually filled with heavy logging trucks which constitute a real traffic menace.

In general, the four-mile stretch of road begins at the southern end of Stone Lagoon Summit and proceeds north on the sandspit separating Freshwater Lagoon from the Pacific Ocean, crosses the bluff at Lookout Point, then swings off in an easterly direction, through low, swampy ground.

After a five-year series of tests and investigations, the project was planned as follows:

1. A two-lane roadbed on the sandspit on a level grade, at elevation 30 feet above sea level, and entirely on the lagoon side of the crest of the spit, where the force of the tide would be practically nil.

2. Wide protecting berms outside the central roadbed. If surf action threatened to erode the berms, there would be sufficient time before the road was atacked, to devise and execute counter measures.

3. A heavy riprap near the ends of the sandspit to serve as extra protection where the surf action would probably be more severe.

4. A 6-ft. by 6-ft. concrete box culvert through the fill across the sandspit to control the elevation of the lagoon water. Also, a removable plank bulkhead over the outlet end of the culvert to prevent plugging by surf and wind-borne sand.

Handling a 220-ft. Deep Cut

Soon after the contract was awarded on April 1, 1949, grading was started. This work was done almost entirely by carryall scrapers towed by track-laying tractors for short hauls, and by rubber-tired tractors for long hauls. These latter tractors were especially practical for moving the 235,000 cubic yards of material from Lookout Point cut for distances between 1,500 and 6,000 feet, all on level grade.

Lookout Point, located on the north end of the highway unit, presented a major excavation prob-

● ***EQUIPMENT was used freely, mostly heavy equipment. Contract involved 800,000 cu. yds. excavation and 220-ft. deep cut.***

lem. Here, the 376,000-cubic yard, 220-foot high cut was excavated on 1:1 slopes and was designed with benches to provide greater stability. The first bench is 60 feet above roadway grade, and the two successive benches are 120 feet and 180 feet, respectively, above grade. Width of each bench is 25 feet.

Lookout Point, located at the northerly end of the sandspit, is of disintegrated graphitic schist. This was excavated by Caterpillar D8 dozers, and hauled by La Plante-Choate 14-yard scrapers pulled by DW 10 Caterpillar tractors. Le Tourneau 22-yard Carryalls pulled by D8 Caterpillars were used principally in constructing fills and grades. In the few places where quartz outcrops occurred, Caterpillar rippers were used to loosen the schist.

However, as the excavation of the cut progressed, considerable free moisture began to develop in the graphitic schist. If allowed to remain, this free water might cause over-saturation of the soil in the cut banks, and perhaps cause a major slide.

Horizontal Drains Stabilize Cut Faces

Finally engineers decided to drill many near-horizontal holes or "horizontal drains" on a draining grade, into the face of the cut bank in order to tap the water-bearing pockets. Then perforated metal pipes were inserted to prevent cave-ins, thus permitting the water to drain out and providing a comparatively dry and stable shell 100 to 200 feet thick on the face of the cut.

These drain installations were made between July 5 and November 2, the "dry season" in this district. Twenty-three holes were made and an average of 130 feet of two-inch perforated black pipe was installed in each hole, with a maximum of 207 feet. After the holes were drilled, it was discovered that 22 of the 23 produced enough water to constitute a "flow." The highest flow from any one holed was 21,500 gallons per day.

These holes were drilled just above the floor of each bench and two or three feet above the finished grade of the highway, so that the entire cut would be dewatered. In general, it was observed that when water was tapped in the lower holes, the flow decreased perceptibly in the higher holes, indicating that the same stratum of water was being tapped. In the case of Hole 21, the exceptionally heavy flow indicated that a water pocket had been tapped. By November, most of the holes had run dry, but winter rains were expected to start them flowing again.

North of Lookout Point, the highway passes low-lying bottom land for 6,000 feet. Throughout this entire distance, the road was placed in continuous fill varying from 0 to 13 feet in depth, and averaging 8 feet. Approximately 4,000 feet of the fill covers wet and swampy ground where firm bottom often lies as much as 40 feet below the surface. Building a road bed across this swamp was expected to be difficult as it was anticipated that the sheer weight of the fill would force some of the swamp water upward.

Construction Across Swamp

To permit this water to escape, beach sand, composed of pulverized schist, was dozed onto the roadbed making it stable enough to hold scrapers. This blanket of sand varied in thickness from 2 to 5 feet, and was hauled from the nearby beach by carryall, deposited on previously placed sand, and shoved ahead into place by dozer. An average of 2,500 cubic yards was placed per day by seven carryalls. The embankment, which is 60 feet wide, was then allowed to settle for a few days, while the weight of the fill squeezed out water which ran into ditches on either side, and thence to the ocean.

The escape of the water was measured by pressure gauges, buried in the foundation. If the water did not escape fast enough, the entire fill could collapse. Accordingly, the fill was placed at a specified maximum rate—not more than one foot in 24 hours, nor more than three feet in one week. If these rates did not permit proper consolidation and stabilization of the foundation material, the engineers could temporarily suspend further placing of the fill. Actually, it was necessary to suspend operations only four times for a total of four days.

In order to pre-settle the portion of the fill where settlement was expected or already occurring, the fill was constructed a maximum of three feet above finished grade, thus eliminating future restoration of grade and surfacing. This overload remained in place until just before the beginning of surfacing operations.

Besides the difficulty of building the section of road across swampy ground north of Lookout Point, another difficulty was encountered—that of constructing a 4500-foot fill on Freshwater Lagoon sandspit, just south of Lookout Point. This project included construction of a fill, 4,500 feet long, and varying in height from 8 to 14 feet. This 183,000 cubic-yard fill was constructed generally on the landward side of the spit, which varies in width from 500 to 700 feet. The fill was protected from surf and tide action by placing 6,130 cubic yards of heavy stone riprap—stones weighing up to 2 tons—at more vulnerable locations along the fill.

These stones, having a specific gravity of 2.90, were hauled from a quarry 19 miles south by a fleet of

● ***LAGOON shown above; ocean at extreme right. Sand-spit at right edge is site of road.***

five 10-yard trucks, and were then dumped on the grade, and handled into place by crane.

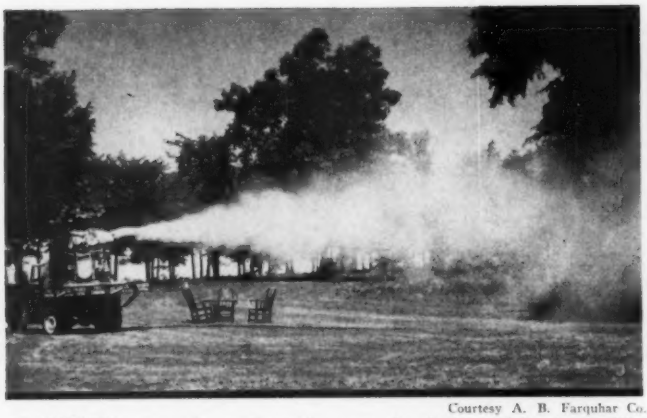
The third section of the road posing a special problem was the stretch directly south of the sandspit, lying in unstable mountain terrain. In this 1.3-mile length, it was necessary to build 11 stabilization trenches to facilitate the escape of ground water. These trenches were generally 12 ft. wide at the bottom, as much as 37 ft. deep, and 200 ft. long. Draglines and bulldozers were used to excavate to firm bottom or to water strata, and the material was then wasted beyond the roadway slope stakes, or, in some instances, was placed as struts or buttresses for the roadway fill.

A perforated metal pipe and a 3-ft. layer of filter material, consisting of coarse beach sand and gravel immediately around the pipe, were placed in the bottom of the trench; and, as side seepage indicated the need, the filter material was carried up the sides of the trench.

The project also included several other details of considerable interest. The drainage problem of the sandspit portion of the road was solved by constructing a 6-ft. by 6-ft. relief culvert on piles through the north end of the sandspit. Also, 45,000 cubic yards of unstable fill foundation material was stripped from an area 900 feet long, up to 150 feet wide.

Contract for surfacing the road was let to a Eureka (California) concern on April 1, 1950, and this work was completed during the early summer in ample time to accommodate the August peak of the tourist traffic. Phil Dunn acted as Resident Superintendent for the Piombo Construction Company, while inspection was under the supervision of the Eureka office of the Division of Highways, with A. M. Nash as District Engineer. The Resident Engineer on the project was H. M. Hansen.

● ***LARGE amount of excavation and long hauls required a good deal of heavy equipment.***



Courtesy A. B. Farquhar Co.

● *PICNIC grounds and parks can be de-insecticized readily.*

objectionable musty odors. During the past summer a new BHC formula, prepared in a special base solvent and having a considerably lesser odor than the crude BHC, has been used extensively. BHC should come into wider use because of its effectiveness against DDT-resistant species, its lower unit cost and almost complete absence of objectionable odor. It is particularly effective against species of flies and mosquitoes that have developed resistance to DDT and, in some areas, Chlordane. BHC is economical to use; finished sprays are now about one-half the cost of DDT formulations. It has a quick knockdown, plus fast kill against most insects. The residual action of BHC is somewhat less than that of DDT, due to the lower vapor pressure of BHC giving this toxicant a fumigant action. Under maximum conditions, a 3-week to 8-week residual against flies and mosquitoes may be expected, depending on the type of equipment used and the gamma content of the spray.

Lindane (Chem-Lin, Gammatox) is the refined gamma isomer of BHC. It is almost free of odor and is preferable for use where heavy residual deposits are required for residential areas, interiors of buildings and homes; and for applications of chemicals at beaches, picnic grounds and outdoor meetings. Lin-

NEW MATERIALS AND

ARNOLD M. LIVINGSTON

Chemical Insecticide Corporation

RAPID technological developments of the past year have added several new chemicals to the list of materials available for effective insect and pest control in 1951. Programs that include community fly and mosquito control, tree spraying, weed control and germicide control around garbage dumps now have more potent chemicals to insure effective results.

More extensive scientific data are available to substantiate the theory of the development of insect resistance. Sharp differences exist as to the reasons that cause this "resistance" but certain methods are available to overcome the problem it presents. In summary, these include:

1. Use of one type of larvicide for adult control and another type for larviciding. Lindane and BHC are recommended for adult control in fly and mosquito programs.

2. Whenever possible, insecticides should be alternated. For instance, after using two or three applications of BHC for adult spray, a shift should be made to such material as Chlordane. By not using one material exclusively, the possibility of the development of a resistant strain of insects is reduced.

3. Effectiveness of insecticide application is reduced unless sanitation measures are employed. An extensive campaign to eliminate breeding areas will make community fly or mosquito control campaigns more successful at a considerably lower cost.

New Formulations

Benzene hexachloride (BHC, 666) in liquid form, either oil or water soluble, is now available for fly and mosquito programs. Although BHC has been produced for several years, its use for such control work has been limited by higher cost and

Courtesy Tri-boro Photos, Inc.

● *FOGGING the refuse dump at Hackensack for insect control.*

● *HYDRAULIC nozzle is useful for fly, brush and weed control.*

up of apdid and red mite populations. Two new types of miticides appear useful against certain species of mites. One material—de-papa-chlorophenyl methylcarbinol (Dimite)—takes effect immediately and has a residual effectiveness of 10 to 14 days. The other—chloroethyl methyl ethyl sulphite (aramite)—is slower acting initially but has a residual action lasting 3 to 4 weeks. Both materials are toxic to warm blooded animals and must be used with caution. A third miticide (Chem-Mite) will receive extensive field testing. It has indicated its potency against European red mites, two-spotted mites and red spiders. This is of particular interest because of its low toxicity to warm blooded animals.

METHODS FOR PEST CONTROL

dane has about the same effective results as BHC; the main differences are that Lindane is more highly refined, lighter in color and about three times as costly on the basis of gamma units. During the refining process, certain isomers are removed which tend to decrease the length of Lindane residual control. This may range to a maximum of 3 to 5 weeks against flies and mosquitoes, depending on the type of equipment used and the gamma content of the sprays.

Aldrin (118), a new chemical compound, has exhibited excellent possibilities in controlling grasshoppers, flies, mosquitoes and certain agricultural pests in the cotton fields. The toxicity of this material has restricted its use for community and civilian purposes, but careful control permits wider utilization. Aldrin has been registered by the USDA for grasshopper control following extensive field tests. It is a volatile chemical and its residual against pests is short—a maximum of one week in outdoor applications. It is toxic to warm-blooded animals and is not recommended for use with mist blowers or for general community spraying.

Dieldrin (Compound 497) is particularly effective against flies and mosquitoes. It has an unusually long residual effectiveness (8 weeks or longer), but it is highly toxic to warm-blooded animals. Use in 1950 by the Public Health Service on experimental projects indicated marked possibilities when carefully applied by experienced operators. It is effective in controlling DDT-resistant flies.

Modified and Improved Formulas

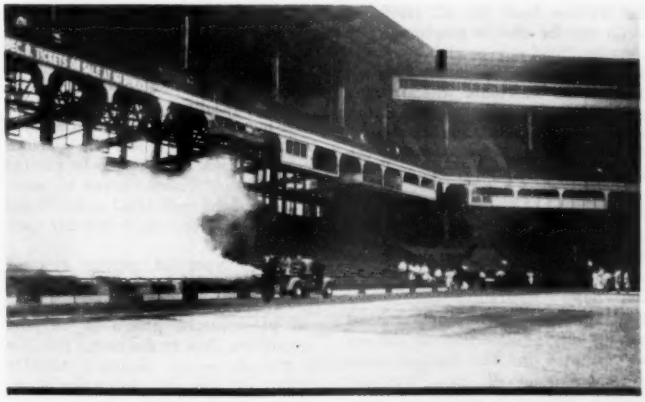
Many modifications and improvements of old formulas have been made during the past year. The following is a summary of some of these.

Miticides.—Application of DDT sprays to trees and some agricultural crops may result in a build-

DDT in White Oil.—This was developed by the Ohio Agricultural Experiment Station, in connection with the USDA. It was found that, by using certain special solvents and DDT, foliage damage was minimized when controlling elm leaf and elm bark beetles. Moreover, the trees had a greener and healthier appearance, and aphid and red mite populations were suppressed. At a negligible cost increase, far superior results are likely.

Weed Killers.—Standard items in the community budget now include

(*Continued on page* 62)



● *BASEBALL fields can be sprayed to eliminate insect nuisances.*

HOW SYSTEM HEAD CURVES SOLVE PUMP BUYING PROBLEMS

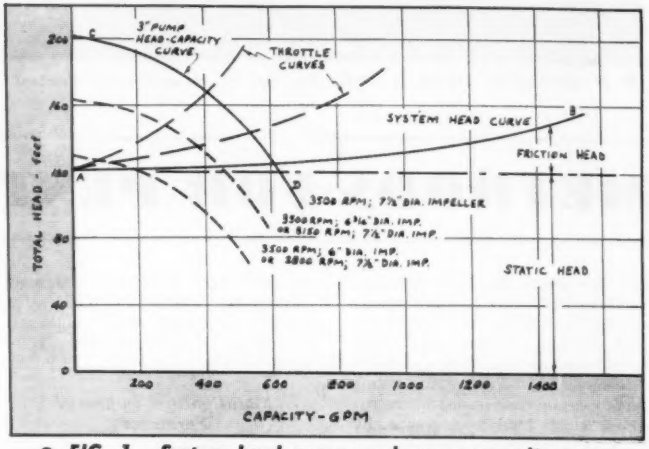
THOMAS F. KEATING

De Laval Steam Turbine Co.

SELECTING the proper design conditions for each pump application is one of the most important problems facing water works superintendents and engineers. To prepare specifications which will assure a pump that will consistently and economically deliver the required amount of water, it is essential for the pump buyer to have a working knowledge of the fundamentals underlying system head curves.

A system head curve is a graph or chart of the head capacity essentials of a piping system. In simple words, it shows the pressure required to push any given quantity of water through the piping layout. A simple application of a system head curve is a pump drawing water from a well and delivering it through a pipe to another elevation. The total head against which the pump must operate is made up of the static head (or vertical lifts), plus a friction head due to the flow of water through the pipes.

The sum of the static heads and the friction head for all needs of water can be shown graphically by a system head curve, such as Curve AB of Fig. 1. The static head is known. To calculate the friction head, data must be available showing the pipe lengths and diameters, the fittings and the condition of the interior of the pipe. There are numerous formulas for calculating the flow of liquids through pipes, but when the liquid is water, it is not necessary to go through hydraulic computations to obtain friction head. Hydraulic tables are available which show friction head loss directly against flow in gallons per minutes for the various sizes and conditions of pipe. Friction through fittings is computed most easily by assuming for each fitting its equivalent length of straight pipe.



● *FIG. 1. System head curves and pump capacity curves.*

A modification to this basic single system head curve is necessary when varying levels of wells or of a reservoir surface require operation under different head conditions. Separate minimum, maximum and normal parallel system head curves must then be drawn corresponding to minimum, normal and maximum water levels.

If an application involves two or more pipe lines discharging from one pumping station, combined system head curves for the various combinations of lines can be plotted from the individual curves by summation of the individual system head capacities of each pipe line for each head.

Some types of piping systems may be quite complex, as in a piping network from which water is drawn off at different points in varying quantities. Due to the many possible combinations of demand usually found, it may be impracticable to represent all conditions by any basic system head curve. This curve should generally be drawn to represent normal design delivery of water, though consideration may be given to maximum and minimum conditions as a check.

If a centrifugal pump head capacity curve is plotted over the system head curve, as Curve CD of Fig. 1, it will be seen that the pump will deliver a specific quantity of water at the intersection point of the system head curve. The pump should be designed for maximum efficiency at this point and a motor size should be chosen to give rated horsepower at this point. Should the demand for water remain constant, such a pump would be adequate and efficient; however, most pump applications must be used for widely fluctuating capacities. Four methods are available for meeting varying demand along the head system curve: (1) Valve regulation, (2) pump speed change; (3) parallel operation; and (4) changing impeller diameter.

Partial closing of a valve on the discharge side of the pump has the effect of increasing the friction head

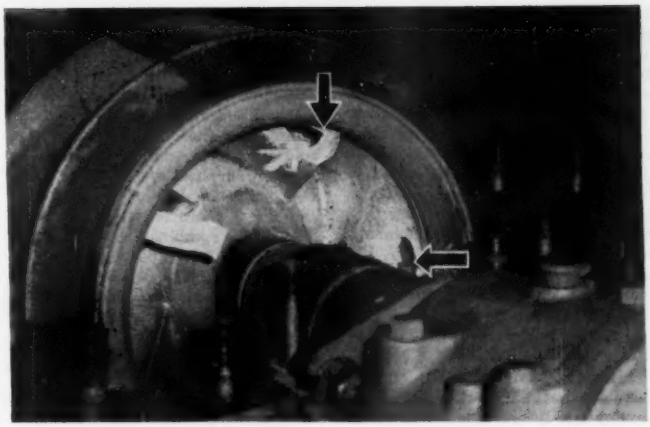
loss in the system and creating a new, artificial and steeper system curve. The intersection point of the pump head capacity curve and the system head curve is moved further back on the pump curve, with resulting lower capacity. This method is inherently inefficient because it adds to the system head a new and unnecessary loss. It also forces the pump to operate off the peak efficiency point. However, this method is low in cost, flexible and easy to control. When it is to be used, a relatively flat pump curve should be specified in order to limit friction head rise when throttling and to obtain higher efficiencies back on the curve. A suction valve should never be used to regulate capacity, since it increases the pump dynamic suction lift, thereby limiting maximum capacity and increasing the danger of cavitation or pitting of the pump impeller.

Increasing the suction lift acts to lower the pressure of the fluid entering the eye of the impeller. When this pressure approaches the fluid's vapor pressure, the resulting vapor bubbles which alternately form and collapse in the impeller may produce serious effects; decreasing the capacity and efficiency of the pump, bringing about noisy operation and perhaps pitting and erosion of the surface of the pump impeller. This action is called "cavitation."

Changing Pump Speed

The pump head capacity curve can be raised or lowered by changing the pump speed, the curve remaining parallel to the original curve. By this method the system friction head is not increased; and while the pump may be operating off the peak efficiency point, its variation may be modified due to the corresponding variation of peak efficiency and speed. This method of meeting varying demands has the advantage that it is possible to increase capacity beyond the design point, care being taken to provide sufficient horsepower for maximum requirements. Variable speed drive may be effected by gasoline or diesel engines, turbines, variable speed electric motors or variable speed couplings.

Variation in pump operation through speed changes can be determined by three rules which apply to normal operation of any one centrifugal pump. Assuming that the efficiency of the new point is the same as the efficiency of the original, which is approximately correct for reasonable speed changes, these are: (a) Pump capacity varies directly as the speed; (b) total head varies directly as the speed squared; and (c) brake horsepower required by the pump varies directly as the speed cubed.

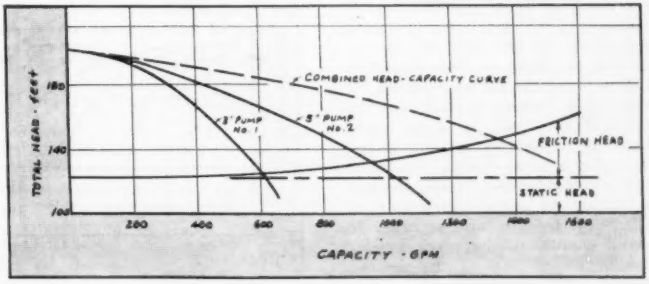


● ***CAVITATION caused this impeller damage. See Fig. 3.***

Parallel Operation

This method utilizes pumps usually designed for different capacities along the system head curve, so that a spread of operating points is provided to meet varying demands. Where the demand is beyond the capacity of the largest pump, various combinations of pumps are operated together in parallel, discharging into a common header. Such operation is shown in Fig. 2, which illustrates the head capacity curves of each of two pumps superimposed on a system head curve. Pump No. 1, a 3-inch pump, when operating singly, will deliver 600 gpm at 124 ft. head with 79% efficiency, and requires 23.8 bhp. Pump No. 2, a 5-inch pump, when operating singly, will deliver 950 gpm at 130 ft. head with 80% efficiency, and requires 39 bhp. The combined capacity of the two pumps in parallel for a given head is equal to the sum of the individual capacities of the two pumps at that head. If the individual capacities of the two pumps are added for each head, a combined pump head capacity curve will be obtained, which will deliver at the point of intersection with the system head curve. For the two pumps indicated, joint delivery will be 1,340 gpm at 144 ft. head. At this point, pump No. 1 is delivering 515 gpm and pump No. 2 825 gpm, both at 144 ft. head. The combined bhp of the two pumps is the sum of the individual bhp at the new operating points.

Paralleling thus forces each of the pumps to operate at a higher head back on its head capacity curve. Pump No. 1 increases from 124 ft. to 144 ft., and pump No. 2 from 130 ft. to 144 ft. Should additional pumps later be added to this system, increasing the combined capacity, it will be seen that each



● ***FIG. 2. Parallel operation of pumps.***

pump will operate back still farther on its own curve. Thus, in order to insure the required delivery and to obtain maximum efficiency from each pump, without going too far back on its curve to meet the higher combined head, fairly steep individual head capacity curves should be specified. Also, the less the capacity change away from the designed conditions of the pump, the smaller the efficiency change. It is beneficial, also, for pumps that are to be paralleled to have as nearly as possible the same shutoff pressure. This will eliminate the danger of one pump delivering through another at low capacities.

This factor can be illustrated by assuming that the shutoff pressure of pump No. 1, above, is 150 ft. (instead of 200 ft.). If the water level into which the two pumps are discharging rises 6 ft., pump No. 1 will be operating at 150-ft. shutoff pressure, with zero discharge, while pump No. 2 is delivering 770 gpm. Any further water level rise produces a greater pressure in the common discharge manifold than in the discharge nozzle of pump No. 1, and reverse flow will begin through this pump.

The fact that a pump, when paralleled will operate back on its head capacity curve is an important consideration, particularly when buying pumps to parallel old units. In many cases a new pump, designed for the identical head as existing unit, never operates at that head (or efficiency) in service. Instead, it operates at an increased head, a reduced efficiency and a reduced capacity, as does any other pump with which it is paralleled. Careful analysis of the system head curve should lead to the proper design of the new pump so as to improve operating efficiencies and add to economy.

Since a pump may be designed for maximum efficiency at only one capacity on its head capacity curve, the question arises in every installation as to which of these operating capacities should be chosen for maximum efficiency. The answer is that a pump should be designed for that point where it will operate most of the time. In some cases, however, it may be desirable to design for a point midway between two commonly used heads, thereby achieving an equal distribution of efficiency. In this case, in order to avoid cavitation, the manufacturer should be advised of the desired operation at both heads so that proper design may be provided. Also, there is a point where the difference between two operating heads becomes so large that one pump cannot be designed to operate efficiently at both conditions.

To illustrate the operation of pumps in parallel, let's take an actual installation of four pumps operating in parallel for 5, 10, and two at 20 mgd. In Figure 3, the combined characteristic curves of the various combinations of the four pumps have been plotted. The design head of 275 ft. is a compromise between maximum head (four pumps in parallel delivering 48.3 MGD at 295 ft. head) and minimum head (single operation at 245 ft. to 250 ft. head for each individual pump). However, desiring to obtain more capacity with single operation from pump No. 4, the operators of this station replaced the existing impeller with one of larger diameter, originally designed for 20 mgd at 325 ft. head and 85% efficiency. The curve for this impeller is indicated in Figure 3. Instead of operating at 325 ft., the pump operated at 250 ft. head down on the system head curve, delivering 25 mgd at approximately 78% efficiency. The impeller was operating at a head for which it was never designed and far below its maximum efficiency point. This condition eventually became too much for the impeller. Although the pump operated satisfactorily for three years, it later became noisy, and upon dismantling was observed to have cavitated severely. This was manifested by considerable pitting and eating away of the impeller around the eye, leaving the metal with extremely porous structure, almost spongelike in appearance. In places, the side shroud was eaten completely through.

Substitution of different diameter impellers without changing speed is employed when the system head demand varies over long periods of time, usually five years or more. Cities with predictable population change frequently employ this method.

Changing impeller diameter has the same effect as varying pump speed (see Figure 1). It raises or lowers the pump head capacity curve parallel to the old curve. The system friction head is not increased as with valve regulation, and while the pump may be operating off peak efficiency at the new point, the variation is modified somewhat by a similar variation of peak efficiency with impeller diameter. The extent of increase or decrease in capacity by changing diameter is limited on the one hand by the pump case restrictions (maximum diameter), and on the other, by the minimum cut at which the impeller will still deliver water efficiently. The percentage of cut for single stage, low specific speed pump impellers ranges from 20 to 30%..

To determine variation in the pump characteristic curve with change in impeller diameter, there are three rules which apply to normal operation of any one centrifugal pump with different impeller diameters. Assuming that the efficiency of the new point is the same as the efficiency of the original, then: (a) total head varies directly as the diameter squared; (b) capacity varies directly as the diameter; and (c) brake horsepower required by the pump varies directly as the diameter cubed.

Often a disadvantage of this method lies in the necessity of selecting a pump, large enough to meet maximum conditions, which will operate off peak efficiency at a

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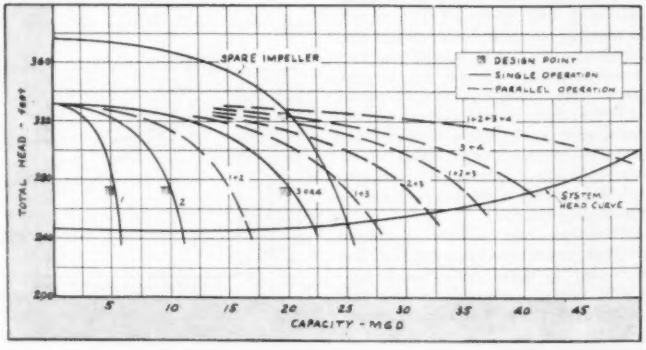


● ***FIG. 3. Combined characteristic curves of four pumps.***

HOW TO DESIGN A SEPTIC TANK FOR USE WITH A FOOD WASTE DISPOSER

This article is based on a publication by Mullins Mfg. Co., Warren, O. Copies of the original can be furnished on request to that Company.

EXPERIENCE has shown that the amount of food waste solids disposed of by a family in a day is approximately equal to the amount of sewage solids. Consequently, the space provided in a septic tank for the accumulation and digestion of sludge should be doubled when a food waste disposer is installed. Since the sludge storage space represents approximately 50% of the tank capacity, and this is to be doubled, the total tank capacity required is increased by 50%. Therefore, the 50 gallons per person, which is generally used in figuring tank capacity, should be increased to at least 75 gallons per person when a food waste disposer is to be installed.

In Table I are given the minimum tank capacity allowances for adults, children and servants, and for family, guest and servant bedrooms.

TABLE I — MINIMUM TANK REQUIREMENTS

Allowance per person	
Each adult	75 gals.
Each child	75 "
Each servant	150 "
Allowance per bedroom	
Each family or guest bedroom	150 "
Each servant bedroom	300 "

Note: Make separate calculations based on persons and bedrooms served. Use larger of these two sums for tank design.

Servants almost invariably use more water than the average, and an extra allowance should be made for them. Also, the septic tank should be designed on the basis of the ultimate capacity of the house instead of on its current population.

TABLE II — MINIMUM TANK SIZE AND CORRESPONDING DRAINAGE FIELD CAPACITY IN GALLONS

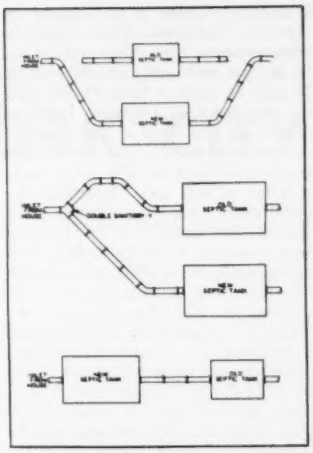
Tank Requirements	*Min. Tank Size*	*Drain Field Capacity*
300	500	200
375	500	250
450	500	300
525	500	350
600	750	400
675	750	450
750	750	500
825	1,000	550
900	1,000	625
975	1,000	675
1,050—1,500	1,500	Note

Note: Drainage field capacity should be 2/3 of tank requirement in gallons.

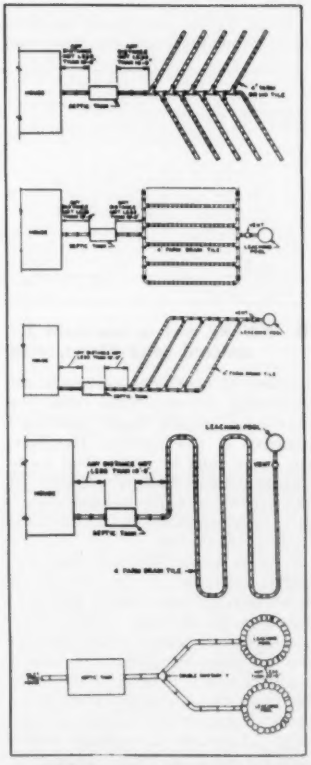
Finding Tank Capacity

The tank capacity is determined by (1) computing the tank capacity based on the number of adults, children and servants; and (2) computing the capacity on the basis of the number of bedrooms in the house. The larger of these two is used in selecting the proper size of tank.

Example No. 1—A 3-bedroom house is occupied by 2 adults and



● ***BY-PASSING old tanks, top; placing tanks in parallel, center; tanks in series, bottom.***



● ***TOP: Tile field, no leaching pool. Next three, various arrangements of tile field and leaching pool. Bottom, leaching pool layout, no tile field.***

2 children. There is no servant or servant's bedroom. Tank capacity requirements are: Two adults at 75 gallons each and two children at 75 gallons each, a total of 300 gals. on the basis of personal requirements. On the basis of bedroom requirements, there are 3 family and guest bedrooms at 150 gals. each, a total of 450 gals. Bedroom requirements are the larger and should be used for determining tank capacity. From Table II, a 500-gallon tank and a 300-gallon drainage field will be required.

Example No. 2.—A 3-bedroom house is occupied by 4 adults, and 3 servants are employed. Personal requirements for tank capacity will be 4 adults at 75 gals. plus 3 servants at 150 gals., a total of 750 gals. Bedroom requirements will be 3 family and guest bedrooms at 150 gals., a total of 450 gals. Personal requirements are the larger and, from Table II, a 750-gal. tank and a 500-gal. drainage field should be used.

Some weight also should be given to entertainment and the maximum number of overnight guests. If entertaining is occasional and the number of guests small, additional capacity is not needed. However, any septic tank serving a food waste disposer must have a capacity of 500 gallons, and 750 gallons capacity is recommended by the Federal Housing Authority.

A food waste disposer does not add appreciably to the amount of liquid flowing into a septic tank and thus does not require a larger drainage field, only larger sludge storage and digestion capacity. Experience indicates that it is better to combine the food waste with the sewage, as better digestion of the sludge results. Therefore, a separate septic tank for the food waste disposer is not recommended. If there is inadequate capacity in the existing septic tank, follow the directions given hereafter for increasing this capacity.

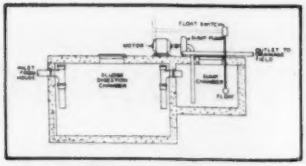
Installation with Existing Tank

The first step is to determine the size of the existing septic tank. Capacity should meet the requirements of Table II. In one-compartment tanks, the total liquid capacity up to the level of the outlet is the capacity on which recommendations in this article are based. In tanks which have more than one compartment, the working capacity, so far as a food waste disposer is concerned, is the liquid volume of the first compartment only. The working capacity of two or more septic tanks in series is the capacity of the first tank only. The working capacity of tanks in parallel is the sum of the individual tank capacities.

A new tank of adequate capacity can be installed by by-passing the old tank or by installing the new tank in the sewer line between the old tank and the house. If this is done, the old tank should be cleaned before putting the new tank into operation. When a new tank is installed to give the required added overall working capacity, it should be in parallel with the old tank, all sewage and food wastes being discharged through one pipe to a "Y". Care must be taken to insure that each tank gets its proper proportion of the flow. These recommended layouts are shown on page 51.

If a grease trap is in use, it should be disconnected, by-passed or otherwise piped so that it serves only sinks receiving large amounts of fats, as in the case of restaurant sinks. The fats in the average home are likely to be so broken up by the food waste disposer that they will pass through the waste pipe and house drain to the septic tank without adhering to the pipes. The septic tank action is not retarded by grease in small amounts.

Flow from showers, bath tubs and laundry tubs may be diverted to leaching pools, thus reducing the load on the disposal field, which is usually the most sensitive part of any septic tank installation. In this connection, it is desirable, whenever changes of the sort discussed in this article are under consideration, to examine the drainage field and to increase its size and capacity if it gives any sign of being overloaded.



● **DESIGN for pumping.**

Planning the Drainage Field

As already stated, a food waste disposer does not add any appreciable amount of liquid flow and a drainage field designed on recognized engineering bases will give satisfactory service. As a matter of good engineering, the area of the site, the topography and the characteristics of the soil should be given consideration.

Ample area is always desirable and a constricted area is an invitation to trouble; in semi-porous soils the area required to provide adequate drainage may be quite large. Rocks, boulders and ledge rock should be avoided because of increased costs and the probability of poor operation. Contours; the presence of trees or shrubs which may extend roots into the lines and block them; and adjacent water supplies should be given consideration.

The capacity of a drainage field is the number of gallons of liquid that it will absorb in a period of 24 hours. This capacity should be equal to and preferably greater than the maximum day of sewage production. Drainage tile and leaching pool layouts are shown on page 51. Drainage lines should be at least 6 ft. apart in porous soils and 9 ft. apart in tight soils. Leaching pools should normally not be closer than 20 ft. edge to edge. Where the ground is very tight, subsurface sand filter beds may or should be used. These may be designed on the basis of 115 sq. ft. of surface for each 100 gallons per day of septic tank discharge. A siphon is desirable to insure even dosage of such subsurface sand beds; and a siphon may be desirable in large installations using drainage fields. Use of a siphon permits periodical flooding

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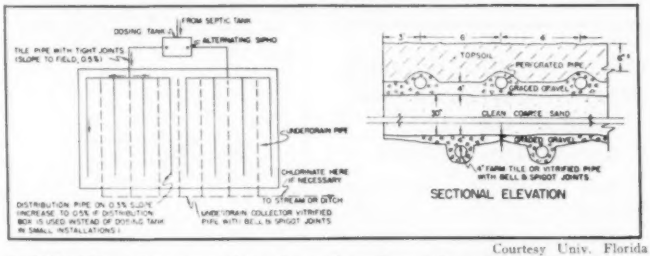

FROM SEPTIC TANK
DOSING TANK
ALTERNATING SIPHO
TILE PIPE WITH TIGHT JOINTS (SLOPE TO FIELD, 0.5%)
UNDERDRAIN PIPE
CHLORINATE HERE IF NECESSARY
TO STREAM OR DITCH
DISTRIBUTION PIPE ON 0.5% SLOPE (INCREASE TO 0.5% IF DISTRIBUTION BOX IS USED INSTEAD OF DOSING TANK IN SMALL INSTALLATIONS)
UNDERDRAIN COLLECTOR VITRIFIED PIPE WITH BELL & SPIGOT JOINTS
TOPSOIL
PERFORATED PIPE
CRACKED GRAVEL
CLEAN COARSE SAND
GRADED GRAVEL
4" FARM TILE OR VITRIFIED PIPE WITH BELL & SPIGOT JOINTS
SECTIONAL ELEVATION

Courtesy Univ. Florida

● **WHERE soil is too tight for subsurface disposal fields, use of covered sand filters, with free discharge, is desirable.**

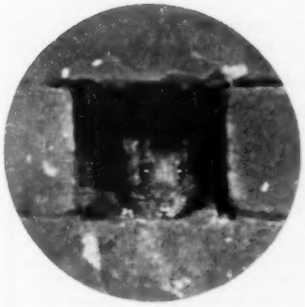
CONTROLLING RATS IN NEW YORK CITY

W. A. Hardenbergh, Editor of Public Works and Consulting Engineer to the Department of Health and J. J. Weinstein, Assistant Director of the Rodent Control Coordinating Unit.

RODENT control in New York City is complicated by the congestion of population; by the type of the population in certain areas: and by the size of the city. Rodent infestation is only moderate and the per capita rat population is probably less than in most other large cities. The greatest density of rat population is in those areas where housing is poor, overcrowding is severe and the population is largely composed of immigrants from areas such as Puerto Rico, Cuba and the cities of the deep south. Many of these folks lack basic education in sanitation and this provides probably the most serious factor in the problem of rodent control.

In Harlem, which is one of the three principal rodent problem areas in the city, there are more than 600 blocks containing nearly 25,000 multiple dwellings, in which infestation is heavy. The population of this section is probably above 80,000 per square mile, or about six times the average of most American cities. In most of these multiple dwellings there are eight to twelve apartments; and in many apartments there are likely to be three to five families. Under such conditions, with several families using a single kitchen, household handling and disposal of garbage is inadequate. Many homes lack suitable containers and there is no law or ordinance specifying how containers for garbage must be used within the home. Often the production of garbage exceeds the capacity of the available containers. As a result of these conditions, "air-mail" delivery of garbage, that is, throwing it out of windows into areaways, adjacent vacant lots or even into the streets, is common.

Under such conditions, it is exceedingly difficult to attain satisfactory sanitation, either private or



public. Despite what would be for most communities the provision of good refuse collection facilities by the city, these areas are in shamefully bad condition. Good sanitation in regard to home and public handling of garbage, generally considered essential in any rodent control program, is not yet in sight in New York City.

Another factor reacting against rodent control by usual methods is the condition of the housing facilities. Most of the old rat infested multiple dwellings are in need of repairs. Their value is low and the application of the usually recognized rat-proofing methods to them would impose a considerable financial burden. Moreover, in some of these areas, improvements are quickly damaged to a point of ineffectiveness.

Planning the Campaign

In planning the rodent control campaign, consideration was given to the following factors:

1. Intensified pick-up of refuse and better collection service by the City would make only a small contribution to rodent control, since inadequate handling of refuse within the apartments is the principal source of trouble. The repeated failure of vacant lot cleanup campaigns attests to this.

2. Education of the public to better household handling of garbage would require a long time and a large staff.

3. Any comprehensive program of inspection and enforcement would require an inspection staff of considerable magnitude. The cost would be approximately an additional million and a half dollars a year. The problems of recruitment, training and replacement of personnel would be serious. Personnel turnover would probably be 30% to 50% annually.

4. In the absence of any appreciable incidence of rodent borne disease, recommendation to the city for the expenditure of the large sums of money required for such a program would require considerable justification especially if less expensive and equally effective means could be found.

5. Any program based on sanitation, public education and rodent-proofing would require ten or fifteen years. Stoppage of the program within three to five years, would represent an almost total loss, since little progress would be made during that time and retrogression would be rapid.

● ***ORIENTATION lecture for pest control operators prior to start of demonstration of rat stoppage and rat proofing procedures.***

6. Application of currently standard rodent-proofing would require an additional large inspection staff for enforcement and maintenance; and would cost the property owners millions of dollars.

In view of these facts, it was decided to reverse the usual order of procedure in rodent control work. Instead of "Sanitate, Build Out and Kill," it was decided to initiate a program of "Kill Now" and to sanitate and build out as quickly as might be possible. It is believed that this program, effectively applied, will result in a reduction in the rat population below the serious nuisance level. It is appreciated that, with environmental conditions remaining favorable for the rodents, a continuous killing program will be required; yet the same continuity would be required for a sanitation program and for maintenance of rodent proofing. In every rat control program, no matter what its nature, continuity of effort is absolutely necessary. Any program that does not take this into account is faulty. Every program must be set up on the basis of the cost to the community and whether or not it is willing to pay and to continue to pay this cost.

Setting up Extermination

Since the primary emphasis was to be on the reduction in the number of rats, the first step was to determine the most effective means of killing rats. There were two possibilities: Organization of rodent control units by the city or the utilization of the commercial pest control operators. The cost to the city for maintaining each exterminator as a member of a rodent control unit would be about $5,000 per year, including materials and transportation; and for the total number required in the Harlem area alone, the cost would be considerable. In addition, the expenditure of public money for the improvement of private property is open to question.

On the other hand, there are in New York City approximately 1,100 licensed pest control operators, for the most part well-trained and equipped, who maintain contacts with building owners and agents. It was clear that, if the work of this large group could be made more effective, a large part of the rat killing problem would be solved. However, as in every business, there is among this profession a group of marginal operators whose only real stock in trade is the willingness to "do it for less." The activities of this group make it difficult for the conscientious operators to obtain work on a price basis that permits a good job to be done.

With the cooperation of the pest control industry, a recommended procedure for rodent control was drawn up—a set of specifications, simpler in nature than, but with the same purpose as, specifications for the construction of a sewage treatment plant, a building, or any other engineering structure. These procedures laid down the standards to be followed by all exterminators in rodent control. A copy of these standards was mailed to every licensed pest control firm and employee, along with notice of a mass meeting to hear complaints and suggestions. At the meeting, complaints were very few. The great bulk of the industry appeared to approve the use of standards.

In order to broaden the base of the work, a demonstration of rat-proofing and rat stoppage work was given the following week in the Harlem area. The Public Health Service demonstration team directed this work, using its mobile shop. A small group of experienced pest control operators, selected from those who took part in the demonstration, was requested to recommend, based on this demonstration, standard procedures in rat-proofing and rat stoppage suitable for New York city conditions. These will be reviewed by the Advisory Committee of the Rodent Control Coordinating Unit and compiled for use by pest control operators. The Advisory Committee, which has been of great assistance in all of this work consists of the Secretary of the National Association of Pest Control Operators, the President of the New York City Association, the President of the Union of Pest Control Employees, and representatives of the Public Health Service, the Fish & Wildlife Service, the New York City Health Department and the New York City Department of Housing & Buildings.

The contract work of the pest control operators is now being checked by us to determine how well it is being done. When it is found that the work is inefficient and that our requirements are not being followed, the operator is asked to visit us and explain why satis-

THE RECOMMENDED PROCEDURE FOR RAT CONTROL

This version of the Recommended Procedure for Rat Control has been drawn up for the pest control industry. The elements included in this procedure, however, are considered to be basic for the guidance of all persons who perform work in the suppression of rats.

1. Examination of Conditions. A licensed exterminator and/or fumigator should examine the premises to determine the extent of, and conditions favoring, rodent prevalence and the remedial measures required. This examination is deemed necessary on all new work, and may be required on all service and maintenance work on which rodent control has been found to be unsatisfactory by duly accredited inspectors of appropriate departments of the City of New York. A written record of his findings in such examinations shall be made by the licensee.

2. On the basis of this examination of the premises, the licensed owner-operator exterminator and/or fumigator should make a written report to the owner of the building, or his designated agent; or, where such work is to cover only a portion of the building, to the principal or lessee of such portion. This report should: (1) present the status of rodent infestation; and (2) state the measures required for effective control thereof. It should include, where pertinent, the measures that may be beyond the scope of the work which the pest control firm proposes to do, and which are the responsibility of the property owner or principal, including rat stoppage work, sanitation, and structural modification or repair.

3. Control Procedures in Dwellings. The following sequence of control procedures should normally be followed except when changes are necessary or emphasis must be varied to meet specific problems: (a) removal of food and water supply accessible to rats from basement or cellar areas to intensify response to baits. Garbage in or adjacent to the basement area should be removed or fully protected; (b) an extermination program, utilizing such poisons as are authorized by the New York City Department of Health and such other methods as the licensed operator deems necessary and expedient. These extermination measures should be continued or repeated periodically until the rat population is effectively controlled; (c) the extermination program should be followed by, or be coincident with the removal of hiding, nesting and breeding places. Existing rat signs and excreta should also be removed in order to permit proper evaluation of the effectiveness of control procedures. Unnecessary stored materials, rubbish and boxes should be removed. Structural harborages, such as cabinets with false or no bottom, broken wooden floors and partitions affording harborage to rodents should be eliminated or rodent proofed; (d) holes and openings in walls, floors or plumbing in the cellar or basement should be repaired and burrows properly filled.

4. Control Procedures in Other Structures. Applicable portions of the procedures outlined in Paragraph 3 should be followed.

5. Reinfestation of Premises from Other Sources. Where the licensed operator reports that rodent reinfestation comes from an off-site rat infested source, the licensed owner-operator should: (1) enlist the cooperation of the property owner, agent or other responsible person to eliminate the source of reinfestation; and (2) notify the Department of Health of the specific source of such reinfestation.

6. Checking the Work. Generally within a period of 15 to 40 days after completing the rat extermination program, the effectiveness of rat control should be checked. Tracking patches and such evidence as fresh tracks and fresh excreta should be utilized; and other methods as are recognized as good practice in the profession should be employed.

factory results have not been obtained. Probably during this initial period, warnings only will be given. Eventually, of course, it will be necessary to require these substandard workers to prove that the City is justified in permitting them to remain in a business which, in part, at least, bears a responsibility for the public health and the public welfare. It is realized that a period of education and cooperation, employing both patience and understanding, will be required before maximum results are obtained from the pest control operators.

Coordination of City Work

Another important job is the coordination of the rodent control activities of the various city departments and the unification of their standards. To remedy a situation in which, after the inspector of one department had approved an exterminator's job, the inspector of another department could place further violations, we are attempting to establish standard procedures to be used by every inspector irrespective of the department by which he is employed. These standards should cover such items as (1) judging the need for rodent control; (2) instructions to the owner and the pest control operator in what must be done; and (3) evaluating the quality of the work that has been done. This is not simple, because the basic laws and responsibilities under which the departments work may differ, and the interpretation of identical terms applying in these departments may vary. A great deal of painstaking work is necessary toward attaining uniformity.

Research is Needed

A third step that is necessary is the establishment of a research program. Despite all of the work that has been done, a great many of the problems of rodent control that arise in a city the size of New York appear never to have been given much consideration. More definitive answers are needed to many questions, as well as new approaches for such large-scale work.

The standard procedures for rodent control which we have adopted tentatively are recognized as elementary and are subject to improvement; but this improvement can come only through developing experience and continuing study. There are no precise data by which to evaluate the results of extermination. It is believed that methods can and should be developed by which the efficiency of an extermination procedure in a building can be measured in terms which will stand up in a court.

We have begun a small program of trapping, combing and examining rodents to determine the normal ectoparasite population. Except for the rickettsial pox outbreak of a couple of years ago, New York has been remarkably free from rodent borne disease. It is felt that it is sound policy, nevertheless, to have a going program for rodent examination and to acquire a background of information on the parasites carried by the rodents in this city.

More information is needed on rodent poisons and the most effective methods of using them in New York City. The conditions under which poisons have to be used in so many of the densely populated areas restrict materially the choice by the exterminator. The efficient 1080 cannot be used except in relatively rare cases; the same is generally true of thallium sulphate and zinc phosphide. The most recent rodenticide, Compound 42 or Warfarin, is being tried and excellent results have been obtained with it.

The Norway rat is proverbially a ground or cellar dweller, but in New York this rat has gone upstairs. He is found in the upper floors of multi-story houses. Approximately 25% of the rat bites reported and of the rodent complaints received are from above the second floor level. Extermination is doubly difficult in the densely populated apartments of our problem areas, especially so because the exterminator cannot gain access during working hours to approximately 30% of the apartments he visits. We want to try to develop a repellent which will drive all or most of the rats out of the upper stories and into the basements where extermination will be easier.

There should be additions to the existing city sanitary code. Despite its probable public health significance, the presence of rats or of conditions favoring rats in dwellings, is not covered specifically by the code. Enforcement must be under the provision of the nuisance law. As a result, there is often delay and lost time on the part of inspectors who bring offenders to court. Recommended additions to the code are now being developed by the Advisory Committee.

This program was initiated in July, 1950, when the Rodent Control Coordinating Unit was formed. The plan has been to develop an effective program that will materially reduce the rat population of the city; that will progressively improve as the pest control operators work more effectively in extermination and in structural repair and modification work; and that will not be a financial burden beyond the reasonable capacity of the city to bear. The budget requested for the coming fiscal year, exclusive of the salary of the director, approximates $40,000.

● ***"AIR-MAIL" delivery of house refuse is a serious problem.***

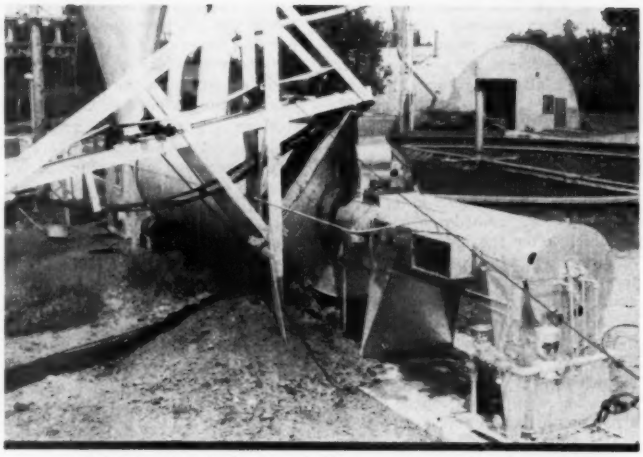
The measurement of results is difficult. Rat bites, of which some six hundred were reported in 1950, may provide a basis; but a study of a number of rat bite reports indicate that quite a few of these are without basis of fact. A spot study during the fall of 1950 showed that nearly one-third of the reported bites could not be verified. It is believed that other factors than actual prevalence of rodents affect reporting. However, there is no question but that there is a considerable rat population in the heavily populated areas of New York City and measuring the reduction obtained in this population may be difficult by any means we now have available.

The cooperation that all city departments have given in this work has been unusually fine; and equally great appreciation is due the leaders of the pest control industry for the share they have had in the program. On the basis of the work in New York City, any rodent control program that does not utilize the skills and the interest of the exterminating industry is missing an opportunity.

SEWAGE SLUDGE CONVERTED TO SOIL BUILDER AND FERTILIZER

THE sludge from the South St. Paul trickling filter plant is being converted to a soil builder and fertilizer using an Arnold dryer. The sludge discharged from the plant is stored "in a pile about 8 ft. high, covering about 4 city blocks." A layer about 10 inches thick is removed at a time. The moisture content of this sludge varies from 50% to 60%. Draglines are used to handle the sludge to an 80-ft. long belt conveyor. This discharges to a gas fired Arnold dryer which is able to evaporate 6,000 pounds of water per hour from the sludge.

A beater is mounted above the dryer to break up lumps ahead of the drying process. The dried sludge has a moisture content of about 8%. Output ranges from 1,400 pounds to 3,800 pounds per hour, depending somewhat on the moisture content of the sludge fed to the dryer. From the dryer, the sludge is blown to a cooling collector and is then ground to a granular consistency by hammermills. The finished product is practically odorless and contains about 2% nitrogen, 2% phosphoric acid and 0.75% potash. The heat treatment renders the material weed free.



● *GAS-fired dehydrator reduces sludge moisture to 8%.*

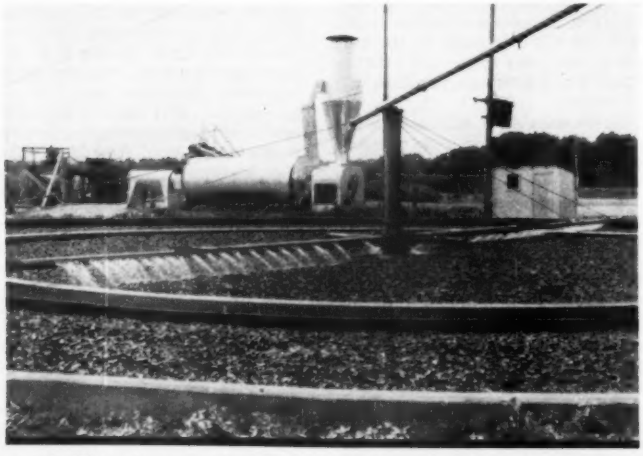
The area contributing waste to this plant contains stockyards and slaughter houses, and the sewage contains much animal and paunch waste, with a considerable grain and hay content.

The conversion of the sludge is being carried on by Soil Builders, Inc., using an Arnold dehydrator made by the Heil Co. This is a standard 8-24 unit.

Soil Builders, Inc., originally sold its product to large commercial users only. Golf courses, cemeteries, orchards, and parks used it in carload lots with good results. Last summer, however, the product was packaged in 5, 10, 25 and 50-pound bags and offered for retail sale in St. Paul for general use by home owners.

To introduce the product and get distribution, the firm conceived the idea of having high school boys solicit lawn feeding jobs directly from home owners. The boys were furnished with self-addressed, stamped cards on which they filled in the name and address of the customer, the square foot area of his lot, and the required delivery date for the fertilizer.

Each boy was equipped with a push-type spreader and on the appointed day a truck left the proper amount of turf builder at the lots specified. The boys were able to quote very low prices, do 5 or 6 lots a day, and make a nice income all summer. Best of all, Soil Builders, Inc., received many fine testimonials and established the distribution coverage they were after.



● *FILTER in foreground, with sludge drying plant shown in the rear.*

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WHEN selecting the equipment manufacturer for your new or improved water conditioning plant, you owe it to yourself and your community to investigate the many superior advantages of INFILCO service and equipment.

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Investigate *now* the many advantages of specifying INFILCO Water Conditioning Equipment *throughout*. Write our executive offices in Tucson. There's a nearby Infilco Field Engineer with all the facts regarding a complete equipment service.

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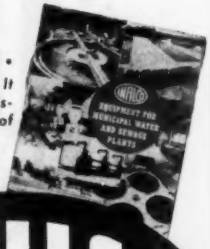
"Big Towns or Small INFILCO Serves Them All"

SEND FOR..

Bulletin No. 60-C. It illustrates and describes many items of Infilco Equipment.



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SANITARY LANDFILL Experience at Memphis

EXPERIMENTATION with sanitary fills began in Memphis, Tenn., in 1947 when it was decided to fill a pond area in the southeast part of the city. Working 28 collection trucks, the area was quickly filled, the refuse being compacted by a D8 crawler tractor. After compaction of the refuse fill, it was covered with 2 ft. of clean dirt, spread and packed in place by the tractor-bulldozer unit.

The area was sold shortly after the fill was completed to TVA to provide space for the expansion of a power station, and construction is now in progress.

Memphis now operates three landfill disposal areas, all within the city, and so located that hauls have been shortened materially—generally to less than 3 miles. Salvage operations are carried on at these fills by contract, Rags, iron, tin and other materials are recovered. The salvage operations return about $7,000 annually to the city.

Two old-style dumps are being converted to landfill at this time. To these, and the three existing landfills, about 2,000 tons of refuse per day will be brought; however, some of the organic refuse is being incinerated.

Landfill operations in Memphis have been successful in reclaiming formerly worthless areas. On areas filled during the past three years are now a large mail-order store, a stadium and a park, in addition to the power station previously mentioned.

Courtesy Caterpillar

● ***AT THE Memphis sanitary fill a tractor and bulldozer spread and compact the refuse and cover it with soil.***

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Residual Iron

All iron in FERRI-FLOC is already in the ferric state and there can be no danger of residual iron passing into the distribution system. Any iron floc that is not removed in the basin is readily removed on the filters. FERRI-FLOC is not an iron remover but users of FERRI-FLOC have found that none of the iron in FERRI-FLOC will pass through the filters. This is just one of the many advantages that FERRI-FLOC offers.

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Sulphur Dioxide is effectively used in water treatment to remove objectionable odors remaining after purification.

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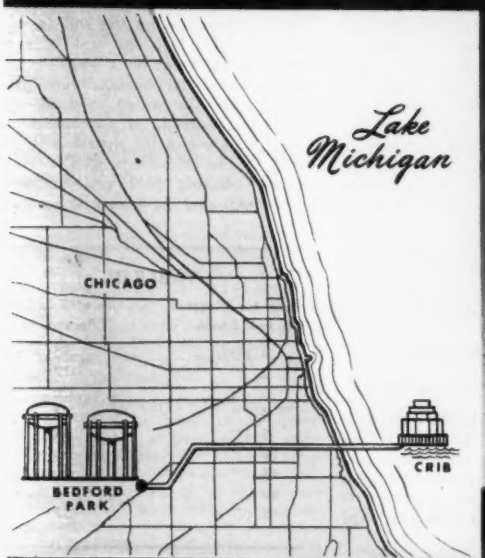
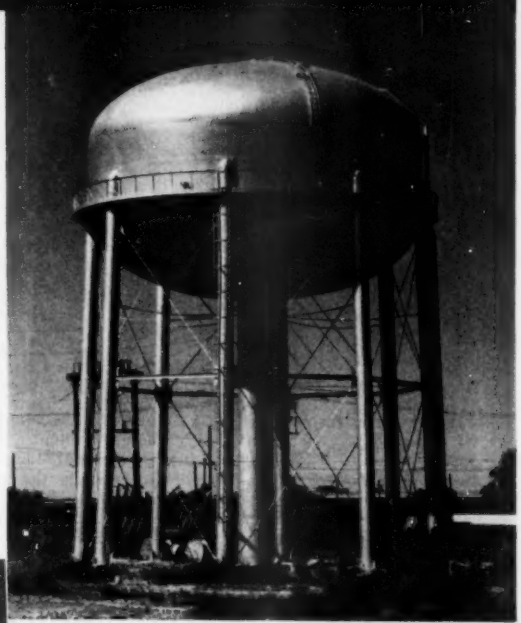
How Bedford Park Makes a Tough Problem ... Look Easy





The Village of Bedford Park, Illinois, is a highly industrial community near Chicago that many plants find ideal for transportation, marketing facilities and expansion.

A check of the water facilities, however, seems to indicate a difficult situation. Bedford Park is over 12 miles from Lake Michigan, the nearest natural source of fresh water, and there is a 6 mg range in daily water consumption.

Careful planning has, however, found the solution.

All water for the Village is purchased from the City of Chicago. Then, to reduce pressure variations in the water system, two Horton ellipsoidal elevated tanks have been installed. This assures a minimum water pressure of 30 lbs. per sq. in.

These two welded steel tanks have capacities of 300,000 and 500,000 gallons respectively, and are especially designed for a low range in head.

Horton elevated tanks are built in capacities from 15,000 to 500,000 gallons with ellipsoidal bottoms.

Write our nearest office for complete information.

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Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

Atlanta 3 ..... 2123 Healey Bldg.	Los Angeles 17 ... 1508 General Petroleum Bldg.
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Boston 10 ..... 1038-201 Devonshire St.	Philadelphia 3 .... 1648-1700 Walnut St., Bldg.
Chicago 4 ..... 2115 McCormick Bldg.	Salt Lake City 4 .... 539 West 17th South St.
Cleveland 14 ..... 2221 Guildhall Bldg.	San Francisco 14 ... . 1525-200 Bush St.
Detroit 26 ..... 1536 Lafayette Bldg.	Seattle 1 ..... 1339 Henry Bldg.
Havana ..... 402 Abreu Bldg.	Tulsa 3 ..... 1641 Hunt Bldg.
Houston 2 ..... 2142 National Standard Bldg.	Washington 6, D. C. ..... 1120 Cafritz Bldg.

For more details circle No. 134 on Readers' Service card

System Head Curves

(*Continued from page 50*)

smaller diameter, lower head condition for a long period of time. When the required bhp motor for the larger diameter impeller is used for the smaller one, there is an added factor of motor loss due to underloaded operation. The economics of the application should determine if a new pumping unit might be a wiser alternative.

As in the methods of parallel operation, careless increases in speed and impeller diameter may cause cavitation, unless the pump is designed to meet such changes. Preliminary plotting of the proposed changes over the system head curve and the relaying to the manufacturer of information on all possible operating heads can prevent costly errors.

Washing Filter Sand in Charleston, S. C.

Filter sand is washed, in Charleston, S. C., by a method, which is described by John R. Betts, Ass't. Manager and Engineer Commission of Public Works. Caustic soda solution, 30% by weight, is mixed in a 55-gal. oil drum. About 3 cu. ft. of the dirty sand is placed in the skip of a small concrete mixer and 4 gals. of the caustic soda solution is poured over the sand. The sand is then dumped into the mixer drum and the mixer started. Several jets of water are directed into the drum while it is rotating, and rotation is continued until the wash water from the drum starts to clear up.

The size of the sand is decreased about 30% by this method, but practically no sand is lost in the process and the washed sand is of better quality than recently purchased new sand. Caustic soda used is 76% NaOH solid caustic in 700-pound drums.

Septic Tank Design

(*Continued from page 52*)

of the entire drainage field or filter, whereas without a siphon a portion of the installation may be overloaded while the remainder takes no load at all. Where pumping is necessary, the design shown on page 52 may be used.

The standard soil percolation test is perhaps the best way to determine the capacity of the soil to absorb the septic tank overflow. A hole one foot square and 18 inches deep is dug in a representative spot on the proposed site of the drainage field. After wetting the soil to insure a true test, the test hole is filled with water to a depth of 6 inches and the average time required for the water to drop one inch is recorded. In the case of a leaching pool, a pit should first be dug to the mid-depth of the proposed leaching pool, and the test hole then dug. In soils where more

TABLE III

Time for Water to Fall 1 Inch	*Ft. of Tile Line Per Person*
1 min.	15
2 "	17
3 "	20
4 "	23
5 "	25
10 "	33
15 "	40
30 "	63
45 "	87

NOW A SELF-CLEANING DIATOMITE FILTER FOR ANY LARGE VOLUME WATER REQUIREMENTS

SPARKLER Model SC *completely cleans itself in just a few minutes*

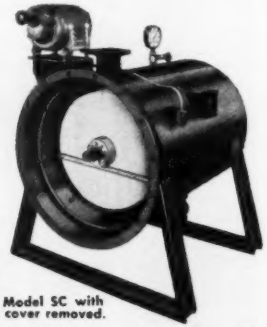
The Sparkler Model SC filter is ideal for swimming pools, municipal water systems, or large industrial uses because it provides a low-cost, self-cleaning means of filtration that meets the most exacting requirements for health and purity.

On the installation pictured here—a typical swimming pool—recirculated water from the 368,000 gallon pool consistently tests as class A—suitable for drinking. Both Enterococci MPN count and coliform MPN count are always less than 3, despite the fact that the pool carries a very large load of swimmers daily.

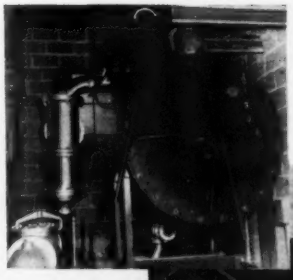
In the Model SC, which is a diatomite filter utilizing hollow discs covered with prefabricated media as the filter element, design and construction eliminate by-passing and channeling. Cleaning of the filter is accomplished by a simple but positive mechanical means that employs an opposed set of nylon brushes to clean both sides of each disc. Then, only a minimum amount of wash water is needed to carry away the discarded cake.

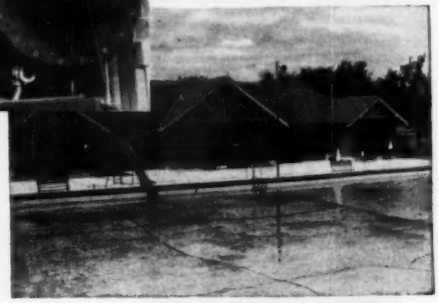
Model SC filters are available in sizes from 15 sq. ft. to 300 sq. ft. A Sparkler Field Engineer will be glad to discuss your particular problem with you.

Write for detailed information and typical plans.



Model SC with cover removed.





368,000 gal. pool at Red Wing, Minn., equipped with Model SC filter operating on a one week cleaning cycle. Entire installation is in 13' x 17' area.

SPARKLER Leopold plate FILTERS

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CINCINNATI IS WHIPPING THE HIGH COST OF BULK RUBBISH COLLECTION

Man-hours required for big tonnage collection cut 60 percent.

The City of Cincinnati gives Eight Reasons Why the Dempster-Dumpster System cuts bulk trash and rubbish collection costs and cuts work time from 2.43 man-hours to .98 man-hours per ton of material delivered to incinerator.

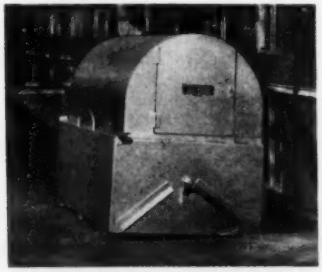
Recently a large Southwestern city, investigating the Dempster-Dumpster System of trash and rubbish collection, requested information from the City of Cincinnati on results obtained with the Dempster-Dumpster System. Here is the reply they received from Mr. Ralph C. Taylor, Superintendent of the Waste Collection Division, Department of Public Works.

"The City of Cincinnati Waste Collection Division has been using the Dempster-Dumpster System to augment its regular collection set up since 1948. Our experience since that time indicates that this system, utilizing the principal of large containers which can be left at rubbish accumulation points and easily picked up and carried to disposal point by a Dempster-Dumpster pick-up unit operated by the driver, is highly desirable. Our records indicate that the operation of these units require .98 man-hours per ton delivered to the incinerator as compared to 2.43 man-hours per ton needed in the operation of conventional pick-up with dump truck and crew.

"I have listed below some of the advantages of the Dempster-Dumpster System as we see them.

"1—These large heavy duty containers can be placed on the ground or in specially designed pits if so desired at the point of accumulation and loaded directly by the recipients of the service rather than placing the waste in some intermediate container. This eliminates rehandling by the collection forces in loading into standard collection units, a costly process.

"2—These containers offer a low loading height, making their application easy to any given situation.



AN APARTMENT TYPE detachable Dempster-Dumpster Container is shown above at accumulation point.

ONLY ONE MAN, THE DRIVER, is required in the Dempster-Dumpster System of municipal trash and rubbish collection. Driver is shown above attaching lifting chains to a drop bottom container. He will return to cab and from hydraulic controls hoist pre-loaded container into carrying position and drive to disposal area where materials will be dumped automatically.

"3—This system eliminates the idle time of trucks standing while loading at these points of large accumulations and eliminates lost labor time waiting for the trucks to return after its trip to the disposal area.

"4—The containers are of rugged construction and are practically indestructible. We feel that one of these containers over a period of time will cost less to buy and maintain than the refuse cans it replaces.

"5—Where necessary, leakproof containers may be used, eliminating the spillage of noisome wastes and the resulting unsanitary conditions.

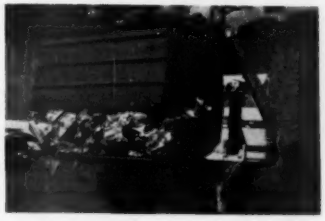
"6—The rat nuisance is practically eliminated with this type of container and we have several outstanding examples where remarkable cleanups were made.

"7—Litter around the loading station is practically eliminated by the use of these containers. This is in outstanding contrast to stations using a great number of the conventional trash cans where the handling of lids and cans by the users usually results in overloading and improper covering.

"8—These detachable containers lend themselves readily to clean dumping at the disposal point. They can also be kept clean and sanitary with greater facility than the small container.

"At the present time in Cincinnati the Waste Collection Division is using these containers for both combustible and non-combustible wastes at the following type of institutions where large quantities of wastes are produced: Schools, Railroad Passenger Terminal (garbage from dining cars), Railroad Produce Terminal, Hospitals, Large Apartment Developments, Social Benefit Functions and Feasts, Circuses and Fairs."

Cities and towns everywhere are installing the Dempster-Dumpster System because no other method of bulk rubbish handling by truck can match the Dempster-Dumpster System in low cost of operation, efficiency, sanitation and good housekeeping! For a cleaner city and a lower budget, it will pay you to investigate the Dempster-Dumpster System. Write today for complete information. A product of Dempster Brothers, Inc.



DEMPSTER-DUMPSTER Container with drop bottom dumping action is shown above as it begins to open hydraulically and discharge trash and rubbish.

DEMPSTER DUMPSTER
TRADE MARK REG.

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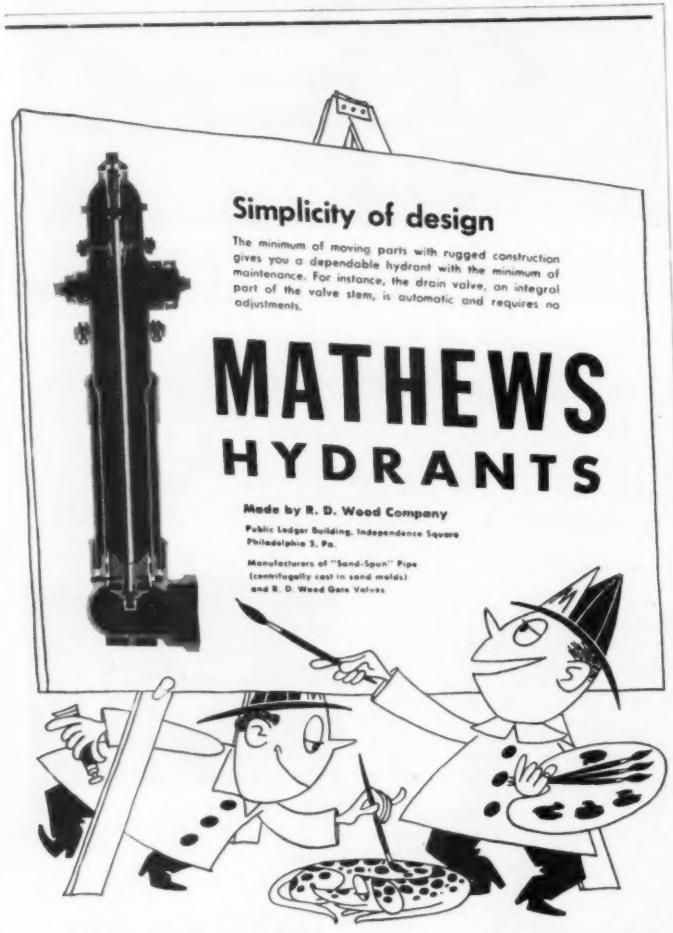
than an hour is required for the water to drop one inch, no attempt should be made to install a disposal field as results will not be satisfactory. A subsurface sand filter bed should be used.

There are various standards to determine how much tile is needed from the results of the percolation test, though most of them give approximately the same results. Table III shows the average requirements for tile field length and Table IV the allowable rate of sewage application per sq. ft. per day, based on the results of the percolation test.

TABLE IV — ALLOWABLE RATE OF SEWAGE APPLICATION PER SQUARE FOOT PER DAY

Time for Water to Fall 1 Inch	For Bottoms of Trenches	For Bottoms of Leaching Pools
1 min.	4.0 gals.	5.3 gals.
2 "	3.2 "	4.3 "
5 "	2.4 "	3.2 "
10 "	1.7 "	2.3 "
30 "	0.8 gal.	1.1 "
60 "	0.6 "	0.8 gal.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Insecticides

(*Continued from page 47*)

2,4-D, sodium arsenite, 2,4,5-T and pentachlorophenol. These are used by Park, Street, Highway, Sewage, Health and Public Works Departments. Many communities have started ragweed elimination and have aroused public interest and support in the work. Improved formulations and better methods of application are available for woody brush control. For ragweed and weeds in parks and playgrounds and along street and highways, 2, 4-D is useful. For eradicating poison ivy, poison sumac, woody brush and other objectionable plants, 2,4,5-T, alone and in conjunction with 2,4-D, has been effective. These materials can be used for control of aquatic weeds and water hyacinths. Extreme care in application is necessary to prevent damage to desirable plant life; instructions and caution statements on the packages must be followed. To prevent damage to vegetation on nearby or adjacent areas, low-pressure, high-gallonage sprayers should be used.

A summary of recommendations, for various types of work and for equipment and materials, follows:

Shade Tree Spraying (for elm leaf beetle).—Use 12% DDT in solution or emulsion with a mist blower; and as emulsion or wettable powder with a hydraulic sprayer. Fog machine application is not recommended. With the mist blower, 2 pints of spray is applied per 50-ft. tree. With the hydraulic sprayer, thoroughly wet the tree. To control possible increases in aphid or red mite population, use DDT-white oil formulation, or add rotenone or nicotine.

Adult Fly Control.—If there is evidence of resistance, use BHC or Lindane; if no resistance, use DDT or Chlordane. With a mist blower or a fog machine, use as a solution or an emulsion; with a hydraulic sprayer, use emulsion or wettable powder. With the mist blower, use 0.5% BHC or Lindane; with the fog machine, use 1%, preferably in solution; with the sprayer use 0.25%. In city areas, care must be taken not to damage or stain buildings or automobiles. In and around business and residential areas, the fog machine is better.

Larval Control.—DDT or Chem-Larv may be used; either solution or emulsion may be used with the mist blower or fog machine; with the sprayer, emulsion is better.

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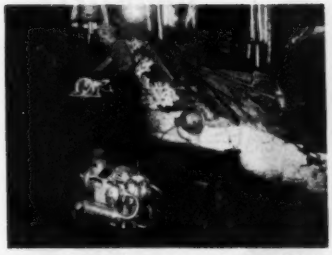

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Mosquito Control.—Use DDT unless there is evidence of resistance, in which case BHC or Lindane should be used. For the mist blower, either solution or emulsion may be used; for the fog machine, a solution; and for the sprayer an emulsion. With the mist blower, use 0.5% BHC or 5% DDT; for fog use 1% BHC or 10% DDT.

Building Exteriors, Sewers and Streets.—The fog machine is best for this work, using 10% DDT, 5% Chlordane or 2% Pyrix in an approved Underwriter Laboratory base. Used as purchased, these compounds will control roaches, flies, mosquitoes and other pests.

Garbage Dumps and Sewage Treatment Plants.—With the fog machine, either a solution or an emulsion may be used; for the mist blower and the sprayer, an emulsion is best. Use quaternary ammonium compounds, 1 to 10 for the mist blower, 1 to 5 for the fog machine and 1 to 20 for the sprayer.

Non-Selective Weed Control.—Pentachlorophenol or sodium arsenite may be used in the hydraulic sprayer. Dosage depends on time of year and height of weeds. Usually 20 pounds of either chemical in 100 gals. of water per acre is satisfactory.

Ragweed Spraying.—Use 2,4-D isopropanolamine salt, in the sprayer, as emulsion or wettable powder, applied at the rate of 1 to 2 pounds per acre, depending on size of growth, density and time of year.

Poison Ivy, Sumac and Broad Leaf Plants.—Use 2,4,5-T isopropyl ester and 2,4-D solution, as emulsion or solution, in the sprayer. Use 1 gallon per 100 gals. of water and apply as a drenching spray on foliage. For stump work use 4% solution in fuel oil or kerosene; use 2,4,5-T alone on 2,4-D resistant species, as well as dormant application on uncut brush.

Grasses.—For Bermuda, Johnson and quack grass control, use sodium trichloracetate, 90%, in the sprayer, 100 to 150 pounds in 100 gals. of water per acre; one-fourth to one-third as much for grass suppression only.

Neutralizing Odors.—Use emulsions or solutions in mister, fogger or sprayer, to mask odors. To cover fuel oil odor, add one ounce of perfume for each gallon of oil. Special neutralizers are available. Perfumes are widely used. In fogging, a masking agent permits use of a cheaper oil carrier, substantial savings and elimination of odor complaints.

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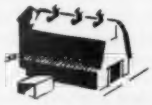
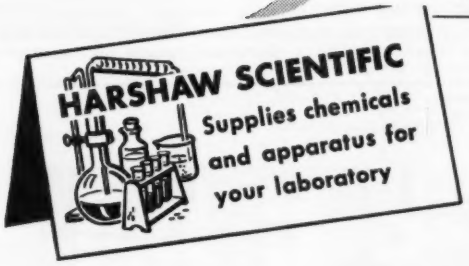


Fungicides



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PUBLIC WORKS DIGESTS

THIS section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

SEWERAGE AND REFUSE . . 66
HIGHWAYS AND AIRPORTS . . 73
WATER WORKS . . 78

THE SEWERAGE AND REFUSE DIGEST

Standards for Irrigation Water

There is a definite need for standards for irrigation waters, to be sure that vegetables, as harvested, do not carry any pathogenic organisms. In order to establish standards of bacterial quality of irrigated water, a careful survey should be made to learn what organisms to select as indicators of fecal contamination, whether coliforms or others. As the water travels in close contact with and through the soil, it is necessary to know the behavior of the contained organisms under such conditions. From experiments, the authors found that coliform organisms persist in soil for long periods. Enterococci, the only other organisms that can be used as indicators of fecal contamination, die out rapidly in the soil. Virulent typhoid bacilli die out in soil much more rapidly than enterococci. The longevity of all these organisms was prolonged with an increase in the organic content of the soil. It was concluded that enterococci are good indicators of public health hazard from sewage in soils and on vegetables.

W. L. Mallmann and Warren Litsky—"Survival of Selected Enteric Organisms in Various Types of Soil;" *American Journal of Public Health*, January.

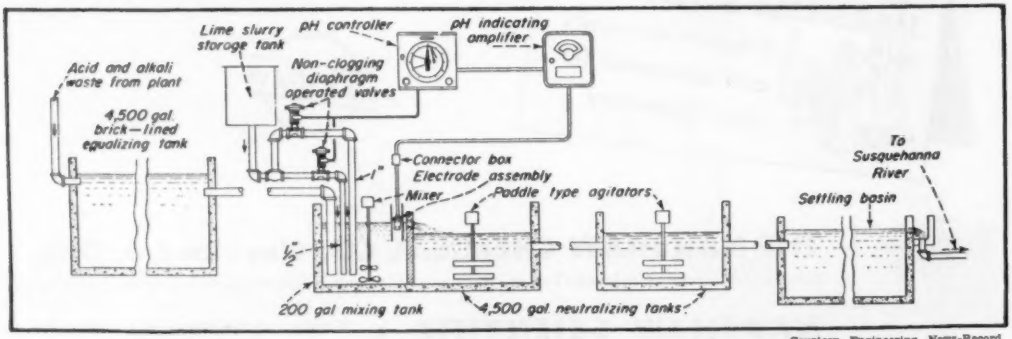
Automatic Neutralization Of Acid Chemical Wastes

At the Sylvania Electric Products plant at Towanda, Pa., about 55,000 to 60,000 gpd of liquid wastes, both acid and alkaline, are neutralized before being discharged into the Susquehanna river. They are first discharged into a 4,500-gal. pit, where they combine into a more or less acid mixture, which is piped to a 200-gal. chemical mixing tank, where lime slurry is mixed with it, about 900 lb. of lime a day being used. The liquid then flows through two 4,500-gal. contact tanks and finally a 4,500-gal. settling basin. Lime slurry is fed, in proportion to the need for neutralization, by an electronic potentiometer pneumatic controller. The controller is actuated by a pH indicating amplifier, which is connected to an immersion-type pH electrode assembly in the outlet of the mixing tank. Set at a pH of 7.0, the controller masterminds delivery of lime slurry through a diaphragm valve operated by an air motor. The control devices and valves, which were furnished by the Brown Instrument Div. of Minneapolis-Honeywell, are serviced by that company four times a year.

"Acid Chemical Wastes Made Harmless by Automatic Lime Slurry Neutralization;" *Engineering News-Record*, Jan. 25.

Automatic Protection Of Aeration System

In designing Philadelphia's Northeast Treatment Works, soon to go into operation to treat a maximum of 125 mgd, the three basic criteria were adequate capacity, efficient continuous operation, and automatic protection against all emergencies.



Courtesy Engineering News-Record

● *HOW wastes are neutralized by mixing and the addition of lime.*

THE SPIRAL CONVEYOR

Jeffrey Spiral Conveyor handling alum and lime in a large Water Works Plant. A section of Spiral flight is also shown.

A COMPACT INSTALLATION

Used extensively in Water Works Plants for handling lime, alum or other chemicals—saving time and cost. Jeffrey Spirals make compact installations—can be made dust-tight. No return strand. Capacities vary with size of unit.

Photo above shows a Jeffrey Spiral installation in a large Ohio Water Works Plant. Note the clamped cover used when handling dusty material—also the various rack and pinion valves in the trough bottom for delivery of material when and where needed.

Catalog No. 803-A fully describes and pictures Jeffrey Spirals. Catalog No. 775-A covers our complete line of Sewage, Water and Industrial Waste Treatment equipment.

Sludge Collectors
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The blower system contains four blowers—two 10,000 cfm and one 13,000 cfm positive displacement, and a 16,000 cfm centrifugal blower; the last provided with a 24" butterfly valve for varying its capacity. All discharge into a common air line, and to prevent back-pressure through a blower which is closed while others are running, a quick-operating butterfly valve was installed on the suction line of each blower, solenoid controlled and weight operated. The blower system is protected against possible overload, undervoltage, power failure, phase failure, overheating and other emergency conditions, by numerous controls, interlocking devices, limit and pressure switches for the prompt and automatic shutdown of any blower unit. Red and green lamps mounted on the control panel show what suction or discharge valves are open or closed. Interlocking and control devices make it impossible to start a positive-displacement blower until the following operations have first been completed:

(*a*) Blower discharge valve is closed.

(*b*) Blower suction valve is open.

(*c*) Blower auxiliary lubricating oil pump is in operation, and oil pressure has reached at least 5 psi.

(*d*) Blower unloader bypass valve is open.

(*e*) Motor-generator set (d-c) is in operation, supplying field excitation current to the synchronous motor of the blower.

Suction and discharge pipes are attached to the blowers with rubber joints to take care of expansion and contraction and to prevent transmission of vibration from blowers to piping system. Also silencers are installed on the suction and discharge line of each blower. To prevent dust from accumulating in the motors, the doors and windows of the blower room will be kept closed at all times, and the room will be ventilated, heated and cooled by conditioned air.

John R. Grandinetti—"Automatic Devices Protect Aeration System for Philadelphia Sewage Works;"—*Civil Engineering*, January.

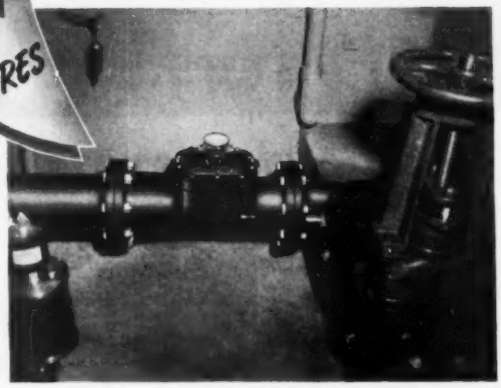
Should We Compost Organic Refuse?

The authors suggest that American cities are overlooking a valuable source of agricultural materials and revenue when they disregard composting for the disposal of organic wastes. Many European cities employ composting methods, using various batch or continuous processes. The batch processes are used most extensively, and include the following: the Indore process, in which alternate layers of readily putrescible materials and leaves or straw are piled 5 ft. deep on open ground or in a trench, mixed with sewage sludge, and fermented for at least 15 days. Materials are turned twice during this period. This method had serious disadvantages due to odor and pest nuisances. The Beccari process attempts to solve these problems by enclosing the materials in a concrete cell of about 20-cu. yd. capacity. Initial decomposition is anaerobic, followed by a further period during which the contents are vented. The Verdier process modifies the Beccari process by recirculating drainage liquors. Mechanical processes include the Dano process which first rotates the refuse to aerate it and break it up, then grinding it to size and further aerating the mass. The resulting material must be further stored and composted by the consumer. The Frazer process forces air up through waste materials moving down through a steel digester tank. The retention

BUILDERS Propelofio METER

FIRST IN FEATURES

Low head loss saves pumping costs



Typical installation in water main.

For metering the flows in main water lines, Builders Propelofio Meter gives much and takes little. It gives high accuracy and at the same time its low head loss saves pumping costs. Due to the Venturi body design, the straightening vanes, and the streamlined housing mechanism, hub, and nose, Builders Propelofio Meter holds flow disturbance and loss of head to a minimum. Throughout its range—and even at overloads up to 150% of its rated capacity — the Propelofio Meter provides reliable, quantitative readings directly in gallons, cubic feet, barrels, or other volumetric units. Installations in industrial and municipal water systems are proving the day-after-day dependability and economy of the Propelofio Meter. For complete information and Bulletins, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 356 Harris Ave., Providence 1, Rhode Island.

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period is 5 to 7 days. The Earp-Thomas process also employs grinding, agitation and aeration, and in addition inoculates the raw materials with a special culture.

It is estimated that sale of dried humus would bring $15 per ton, or $1.50 per cubic yd. of organic refuse, and that total disposal costs would exceed this amount in all but the largest cities. Smaller communities might find composting economically advantageous where land fill sites are not available, especially if sewage sludge were processed in conjunction with other refuse.

Max L. Panzer and Harvey F. Ludwig—"Should We Reconsider Composting Organic Refuse?" — *Civil Engineering*, February.

Disposing of Wastes From Chemical Plant

The Bishop, Texas, plant of the Celanese Corp. produces a variety of synthetic organic chemicals from petroleum hydrocarbons. Cooling water and boiler blow-down discharged from the plant go directly into a public stream, and amount to 200 to 800 gpm. They are harmless to fish, fowl and vegetation, since chlorine residual used for slime control disappears between the plant and the stream and sodium dichromate used as a corrosion inhibitor is present in concentration of about 30 ppm, substantially below the level toxic to fish (70 to 200 ppm). Process waste waters are heavily contaminated with organic chemicals and cannot be discharged directy into public waters. The flow of 400 to 600 gpm is disposed of by solar evaporation on ponds that cover 375 acres. Evaporation is speeded by pumping waste waters from the ponds into rows of spray heads at the top of long pipes. Although evaporation has proved to be the most economical disposal method for the Bishop plant, studies are being made in biological treatment. BOD's of many water-soluble organic compounds have been determined, including several compounds which inhibit bacterial life. Research included the operation of a trickling filter pilot plant with encouraging results.

"Complex Water-Pollution Problems Solved by Applied Research;" *Engineering News-Record*, Feb. 1.

Review of 1950 Sewage Practice

In reviewing the developments in the sewage and industrial waste treatment field during 1950, the au-

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thor observes that they are characterized by the impetus given to stream pollution abatement by state and federal legislation. The number of waste treatment plants under construction continued to grow. Disposal of radioactive wastes received more attention. The composition of domestic wastes was altered more than in any previous year by the increased use of garbage grinders and synthetic detergents. Topics discussed at length in the review include stream pollution surveys which indicate 8 billion dollars of construction over a 10 year period needed to cope with present pollution; new treatment plant designs, such as the Waterbury, Conn. plant which uses sedimentation followed by vacuum filtration, drying and incineration to treat wastes high in copper and chromium; increased use of sludge gas engines; progress in trickling filters, activated sludge, chlorination and sludge treatment and disposal. The problems of industrial waste disposal are given special consideration as is research in the BOD test and other special studies.

Ralph E. Fuhrman—"Sewage and Industrial Waste Treatment in 1950—A Review;" *Water and Sewage Works*, February.

Cleaning Root-Filled Sewers

Jenkintown, Pa. in 1943-45 located all of its 13 miles of sewers and checked their condition as to stoppages, and recorded the information on cards of a file index. (They had not been cleaned since they were laid in 1926, except where and when stoppages occurred.) Roots from shade trees were the cause of the most serious and numerous stoppages, and a map was made on which were marked all spots where root stoppages occurred. All root stoppages were removed during those two years, and since 1945 all known trouble spots have been checked at least twice a year, and the condition indicated on the file cards. For cleaning the sewers, the department uses 450 ft. of "Flexible" 5/16" steel 3 ft. rods, with ratchet turning handles for hand turning and a gasoline-powered drive unit, rod guide, corkscrews, augers and brushes from 2" to 10". The power drive is used only when an obstruction is stubborn or manhole distances are very long. Rodding is always done down stream. Working up-hill against a root stoppage which had backed up the sewage so it overflowed a manhole 10 ft. deep, the root plug suddenly broke loose and rushed like a piston down stream, pushing the long sewer rod ahead of it and out of the manhole into the street, where it whipped around. Now they work down stream on an obstruction, open it slightly to let the sewage drain off, then remove it completely.

Ralph L. Couldron—"Solving the Sewer Cleaning Problem;" *PUBLIC WORKS*, February.

Chlorination of Cyanides in the G. M. C.

General Motors Corporation has found, in studying the wastes problem, that control is more important than treatment. In connection with cyanide wastes, the quantity or concentration can be reduced my making more efficient use of chemical agents and less wastage by spillage and carryout; by recovery of chemical agents by use of reclaiming devices; or by replacing the present process by one giving the same results without forming an obnoxious waste product. Among such processes are substitution of "gas cyaniding" for the molten salt bath cyanide treatment of steel; and substitution of an acid copper plating system for the copper cyanide bath.

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Other possibilities being studied include: 1. Use of thiosulfates for conversion of the cyanide to thiocyanates. 2. Use of certain metals already existing in the plant wastes as complexing agents with the cyanides. 3. Precipitation of cyanides as heavy-metal cyanides, which may be reused in plating processes. 4. Reacting the copper-ammonia complex with cyanide to form cyanates and insoluble cuprous cyanide. 5. Substitution of sodium hypochlorite solutions for chlorine gas to eliminate difficulty from high heat of solution and low solubility in connection with chlorine gas application.

Experiences of divisions of G.M.C. at Detroit, Pontiac and Anderson, Ind. are described in detail.

David Milne — "Experience with Chlorination of Cyanides in the General Motors Corporation;" *Sewage and Industrial Wastes,* January.

Disposal of Radioactive Wastes

Methods for the disposal of radioactive waste materials that have been used in practice include dilution or concentration and storage. Dilution may consist either of addition of water to reduce radioactivity below tolerance levels, or dilution with stable isotopes of the radioactive elements so that as this element is taken up in a living body the radioactive portion will be relatively small. Even with dilution, disposal of radioactive materials in streams should not be condoned. Where soil conditions are favorable some wastes may be discharged into underground cribs from which they will leach gradually or become permanently attached to certain clays. In this connection, it has been suggested that the addition of certain clays might be used to treat mixed fission products, but the large volume of clay required appears to be a major deterrant. Other methods of concentrating wastes have been considered and include the absorption on sewage sludges, flocculation and settling, ion exchange, and evaporation. Of these, the biological concentration method of activated sludge appears to be most economical. Disposal of the resulting sludges is the major problem. At present most of it is stored in tanks to permit the mass of material to decrease in activity by radioactive decay. In other instances the material is placed in suitable containers and buried.

Conrad P. Straub—"Problems in Disposal of Radioactive Wastes;" *Wastes Engineering,* February.

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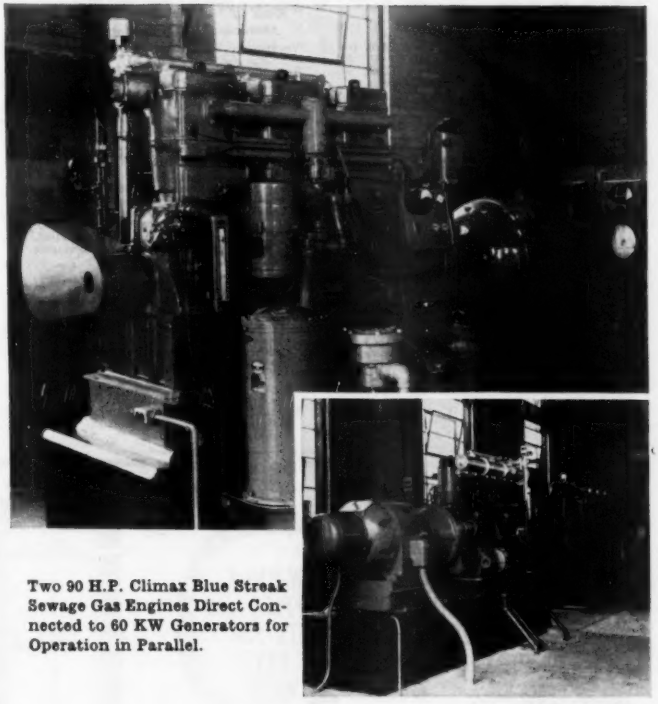

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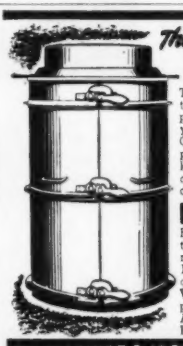

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Rating for Streets and Highways

Berkeley, Calif., has established a factor for determining the need of any street for resurfacing, by measuring the surface roughness with a modified B.P.R. road-roughness indicator, combined with a factor for traffic volume. Roughness index in inches per mile for rural highways is considered excellent if below 100; good if between 100 and 150; 150-200, fair; above 200, rough. On secondary streets where speeds do not exceed 35 mph, below 125 is considered excellent; 125-200, good; 200-300, fair; 300-450, rough; above 450, very rough. A study to determine the average number of trips per day to and from residential areas gave 6.9, 6.2 and 6.0 trips per day per dwelling for three such areas; which figures are believed to be somewhat above the average for the entire city. Any street having a roughness of 450" or more received priority for treatment, regardless of traffic, and those below 200" were not considered. A formula was developed for combining roughness measurements with traffic volumes to rate a street for priority of treatment.

Ralph A. Moyer, Richard Gallagher and John W. Shupe—"A Rating Method for Street Resurfacing;" *PUBLIC WORKS*, February.

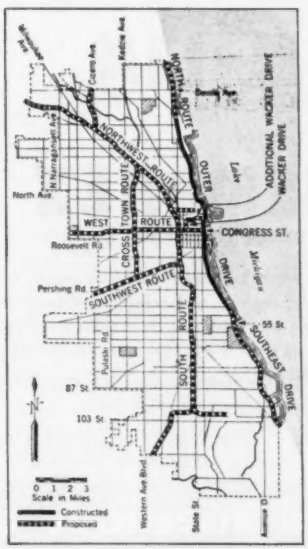
Numerical rating of county highways has permitted a sound planning and programming of highway improvements, and provides a method of determining if the highways are being improved. The rating points are divided into 3 major categories: Condition, 35 points; Safety, 30 points; Service, 35 points. Condition is divided into structural adequacy, 17; anticipated remaining life, 13 (one point for each estimated year); maintenance economy, 5. Safety is subdivided into roadway width, 8; surface width, 7; sight distance, 10; consistency, 5 points. Service to the road users is the dispatch and ease with which a trip can be made. It includes alinement, 12 points; passing opportunity, 8; surface width, 5; sway in cross-section, 5; roughness of texture, 5. Ratings according to the above are adjusted so as to give greater priority to heavily traveled roads.

William E. Willey—"Numerical Ratings of County Highways;" *PUBLIC WORKS*, February.

Emergency Prefabricated Surfacing Material

Prefabricated bituminous surfacing, consisting of layers of loosely-woven burlap and paper felt impregnated with tar or asphalt and coated with a high softening point asphalt, was used during World War II to provide a waterproofing medium and wearing course for roads and airfields. This surfacing, supplied in rolls similar to roofing, is applied by a simple unwinding machine which coats the surfacing with a plasticizing solvent made of a mixture of gasoline and diesel oil which converts the solid coating into an adhesive for joining overlapping strips. When applied to roads or airfield runways, two or more layers of the prefabricated surfacing are used, with the outer margins turned down into a 3-foot trench for a groundwater cutoff.

Charles M. Baskin—"Has Prefabricated Bituminous Surfacing A Peacetime Usefulness?;" *Roads and Engineering Construction*, January.



Courtesy Civil Engineering

● ***CHICAGO Superhighways.***

Brittle Steel Blamed For Bridge Collapse

At 3 A.M. on January 31, four of the eight spans of the Duplessis bridge at Three Rivers, Canada, suddenly collapsed. Four early-morning motorists lost their lives. The 1,380-foot long bridge was of welded plate-girder deck construction, continuous over eight spans, and consisted of two girders, 32-ft. apart, having six 180-ft. spans and two 150-ft. spans, with cross beams at 10-ft. intervals. It carried a 42-ft. wide, 8-in. thick concrete roadway and two 5-ft. sidewalks. Bottom flanges of the continuous girders were parabolic, 12-ft. deep at the piers and 8-ft. deep at midspan. Collapse of the bridge is attributed to structural failure due to faulty materials. In February, 1950, a fracture was discovered in another section of the bridge, and also one in one of the sections which fell nearly a year later. Laboratory tests showed that the plates fractured a year ago to be of rimmed steel found to have a particular tendency toward brittle behavior at low temperatures. At the time of the collapse, the temperature was nearly 30 degrees below zero.

Frederick S. Merritt—"Bridge Collapse in Quebec Charged to Brittle Steel;" *Engineering News-Record*, Feb. 8.

Superhighways for Chicago

A point has been reached where the addition of another major thoroughfare to Chicago's over crowded

street system only serves to create more intersections and more interference to traffic flow. After thorough study of street transportation a general plan for a comprehensive system of superhighways was adopted in 1940. At that time, the system was estimated to cost about $205,000,000. Since that time increased costs and additions to the system, which resulted in the master plan shown in the accompanying map, have raised the cost to $446,000,000. The City of Chicago, Cook County, the State of Illinois and the federal government will all share construction costs, but even under this sharing plan, funds in sight will permit construction of only a part of the system in a reasonable time. Hence a priority system costing about $223,000,000 is programmed for completion in 1959.

Some of the fundamental design features are:

1. All cross traffic, both pedestrian and vehicular, is to be eliminated by depressing the roadways or, in special locations, by elevating them.

2. Only important streets will be carried over the depressed section; all other streets will be cut off.

3. Main roadways will usually consist of four or more 12-ft traffic lanes in each direction with a capacity of 1,500 vehicles per hour per lane.

4. Opposing streams of traffic will be separated by a median strip, usually 24 ft wide, but reduced to a 4-ft width on structures.

5. Maximum grade will be 4 percent.

6. Design speed is 60 mph for main roadways.

7. Access will be by entrance and exit lanes at controlled locations only. Abutting property will have service drives at street level to connect with entrance and exit lanes.

8. Provisions will be made for use by mass transit vehicles. In the Congress Street Superhighway (West Route) the existing elevated structure will be removed and tracks of the new subway will be laid in the median strip.

9. A continuous shoulder 10 ft wide will be provided for disabled vehicles.

10. Unpaved parts of the right-of-way will be suitably landscaped.

11. Pavements will be 10-in.-thick concrete on a granular base.

V. E. Gunlock—"Chicago Builds $230,000,000 Superhighway System;" *Civil Engineering*, February.

Benefits of Two-way Radio

According to the Federal Communications Com'n, 62 state, county and city highway departments have received, or are in the process of securing, permits to use radio frequencies, and six others are preparing to apply for permits. A committee of the A.A.S.H.O. lists 11 specific benefits resulting from the use of radio: (1) Reduction in losses in operating time resulting from equipment breakdown, and more direct supervision by engineers. (2) Reduction in amount of paper work. (3) More effective equipment utilization and team work between county road districts. (4) More effective parts inventory control, and transfer of parts between districts. (5) Prompt service to highway users. (6) Time is saved by having men report directly from the job site. (7) One operator instead of two on snow plows. (8) Saves lives in emergencies, such as snow slides. (9) Snow and ice conditions can be reported promptly to the general public. (10) Makes it possible to provide prompt tow-truck service to stalled vehicles. (11) Used effectively in traffic-ca-

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pacity and speed studies and in sight-distance surveys.

"Benefits of Radio Felt Every Day;" *Better Roads*, January.

Surface Dressing For Prepared Subgrade

If a prepared subgrade is not protected from weather before the pavement is laid, it may become too dry or too wet. A case is cited where a concrete surface was laid on a too-dry clay subgrade, which later absorbed water and swelled so unevenly as to cause one slab to rise 2" higher than others. The (English) Road Research Laboratory investigated the effect of a temporary surface dressing to prevent moisture changes and perhaps to carry some construction traffic. In July a stretch of prepared subgrade was primed with tar, 3 sq. yd. per gal., followed by a tack coat of 5 sq. yd. per gal. and ¼" stone chips, 140 sq. yd. per ton, sprayed with tar, covered with ½" stone chips and rolled. Before paving, the average moisture content of the top 6" of the subgrade was 13% and that of the shoulders 10%. By winter, the moisture content of the subgrade had increased to 17%, then dropped to 16%, which was considered to be the equilibrium content for that soil, and remained constant at that for 10 months. The shoulder moisture content increased from 10% to 26%, dropped to 7% during the summer, then rose to 23% by December. The subgrade was a silty clay. Probably in more favorable soil a single surface dressing would be sufficient.

W. A. Lewis—"Use of a Surface Dressing for Protecting a Prepared Soil Formation;" *The Surveyor*, Dec. 29.

Cutting Down High Shoulders

Cutting down high shoulders is a major task of maintenance in many states. Although it may destroy well-established sod and wet base shoulders may present a traffic hazard and maintenance problem, the temporary disadvantage is more than offset by the permanent advantage. Illinois uses self-propelled loaders of several makes, which remove windrows left on the shoulders by motor graders. A truck is loaded in about 2 min. and 75 to 115 cu. yd. of dirt are loaded per hour. C. W. *Ross*, Engr. of Maint.

Indiana's Highway Com'n uses 7 power windrow belt-type loaders almost exclusively for loading sod and earth cut from high shoulders.

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Averaging work in several districts, the material removed per mile has been 275 cu. yd. at an average cost per mile for labor plus equipment charge of $261.70. In general, each outfit uses 1 heavy-duty motor grader to cut the shoulder and windrow the material, a loader to load it into 4 to 12 dump trucks (depending on length of haul); and, when ditch renovation is necessary, a crawler tractor and a heavy pull-type grader. *Earl B. Lockridge.*

"High Shoulders: What Middlewestern State Highway Departments Are Doing About Them;" *Roads and Streets*, January.

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Deep, Lightweight Piers for Bridge at Yorktown, Va., Built by Caisson Method. By *Maurice N. Quade*, Proj. Engr., Parsons, Brinckerhoff, Hall & Macdonald, Engrs. February, Pp. 28-32.
Chicago Builds $230,000,000 Superhighway System. By *V. E. Gunlock*, Commr. of Subways, & Superhighways, Chicago, Ill. February, Pp. 38-39.

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Prestressed Concrete Elevated Highway. By *Cedric Stainer*. Jan. 31, Pp. 19-23.

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Wholesale Street Improvements Make City Look Better, Motorists Feel Better. By *Charles Zwally*, Res. Engr., Gannett, Fleming, Corddry & Carpenter. Feb. 1, Pp. 43-44.
Bridge Collapse in Quebec Charged to Brittle Steel. By *Frederick S. Merritt*, Assoc. Editor. Feb. 8, Pp. 23-24.
Build Double-deck Concrete Viaduct to Bypass Downtown Seattle. Feb. 15, Pp. 43-45.

Highway Magazine

The Pennsylvania Turnpike Stretches East and West. By *C. W. Carleton*, Managing Editor. January, Pp. 4-7.

Municipal Engineering

Replacing Two-Coat Asphalt with Bituminous Carpet. Dec. 29, Pp. 254-255.

Public Roads

Design Capacity Charts for Signalized Street and Highway Intersections. By *J. E. Leisch*, H'way Engr., B. P. R. February, Pp. 105-139.

Public Works

How a Poor County Can Be Rich in Road Euipment. By *James Grattan Cooney*, Supt. of H'ways, Clinton Co., Ill. February, Pp. 41-42.
International Air Terminal at Isla Verde, Puerto Rico. February, P. 45.
A Rating Method for Street Resurfacing. February, Pp. 50-51.
Numerical Ratings of County Highways. February, P. 51.
Street Pavement Design and Construction. By *W. L. Chilcote*, Deputy H'way Engr., Baltimore, Md. February, Pp. 60, 62.
How To Use Rubber-Asphalt Joint Compounds. By *C. E. Brokaw*, Supt. H'way Maint., Cincinnati, O. February, Pp. 76-77.

Roads and Engineering Construction

Stave River Highway Bridge Follows New Pattern. By *George Sheldon*, Gen. Supt., Prepakt Concrete Co., Ltd. January, Pp. 63-67, 110.
Has Prefabricated Bituminous Surfacing A Peacetime Usefulness? By *Chas. M. Baskin*, Cons. Asphalt Technologist, Imperial Oil Ltd. January, Pp. 74-80, 84.

Roads and Streets

New Jersey Turnpike Contractors Complete $41,000,000 of Work During 1950 Season. January, Pp. 35-43.
How to Cut Your Earthmoving and Construction Costs. By *Le Tourneau* Field Engineers. January, Pp. 46-49.
High Shoulders—What Middlewestern State Highway Departments Are Doing About Them. By *C. W. Ross*, Maint, Engr., Ill. Div. of H'ways and *Earl B. Lockridge*, Maint. Supt., Indiana H'way Comn. January Pp. 50-52.
Steel Pile Bridges in Kent County, Michigan. By *L. W. Brunson*, Bridge Eng'r. of Kent Co. January, Pp. 56, 58.
How an Indiana County Has Achieved Durable Low Cost Roads. January, Pp. 77-79.

The Surveyor

Use of a Surface Dressing for Protecting a Prepared Soil Formation. By *W. A. Lewis*, Road Research Lab. Dec. 29, Pp. 675-676.
A Case for Improved Road Surfacing. By *Thomas Vickers*. January 5, Pp. 3-5.

NO TIME LOST!
LOADING OR LAYING ITS LOAD
A STANDARD STEEL PRESSURE DISTRIBUTOR GIVES EQUAL CIRCULATION THROUGHOUT THE SPRAY BAR FOR A UNIFORM SURFACE FROM CURB TO CURB FOR LONGER WEAR
STANDARD STEEL
PRESSURE DISTRIBUTOR
The Model 424 can be loaded in quick time for a "fast getaway". A two-way cleaning system guarantees a clean spray bar at the end of the day. First, the material is sucked out of the bar and back into the tank. Then by turning one small valve, cleaning solvent is released into pump and spray bar (without contaminating the asphalt in the tank). No time lost in tinkering — no time lost in loading — Standard Steel 424 keeps going all day long far ahead of the "gravel gang"
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Built to the Highest Standard
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Standard Steel Works NORTH KANSAS CITY, MO.
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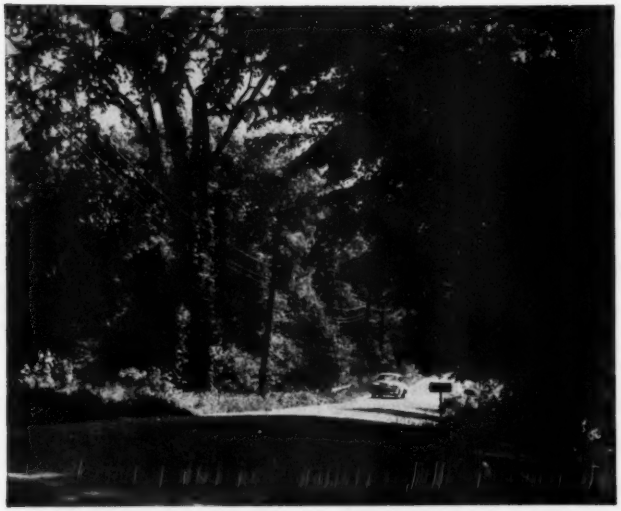
THIS ROAD PAYS OFF HANDSOMELY...



Blending with every landscape and free from glare, roads built with Tarvia* road tar take the strain out of driving. They are self-healing under impacting traffic.

The heat-absorbing qualities of black roads built with Tarvia* road tar make them easier to keep open in winter, as snow and ice melt more quickly. And they are not affected by chemicals used to remove snow and ice.

because

1. Roads built with Tarvia* road tar improve with age. Occasional applications will renew the life of the surface, and replace worn-away material.

2. TARVIA road tar penetrates surfaces and binds together the underlying material. It thus makes possible the inexpensive use of local aggregates.

3. Less TARVIA road tar is required because there are less solvents to be evaporated before the binder becomes effective.

4. TARVIA road tar is unaffected by gasoline, kerosene, or moisture. It retains its original properties.

5. TARVIA road tar holds the aggregate tightly in the surface, and produces a gritty surface which is lastingly skid-resistant.

6. TARVIA road tar may be applied at moderate temperatures, and with ordinary equipment.

The Barrett field man is always at your call for expert practical advice.

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PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Microscopic Examination of Water

Lorain, O., has algae troubles throughout the year, these including tastes and odors, poor coagulation, short filter runs, and variant chlorine demands. Continual fluctuation in species and concentration of algae necessitated constant threshhold odor tests, jar tests and break-point chlorination tests. The amount of this was greatly reduced by making daily microscopic examinations to detect the development of the different species. When they show any significant change in algae type or concentrations, jar tests are begun to determine the optimum alum and carbon dose. Innumerable species of algae are found, the most troublesome being melosira, pediastrum, anabaena, asterionella, synedra and synura. The concentrations have reached 5,000 aceal units. A continuous application of activated carbon in small doses with alum aids coagulation, especially when the water temperature is low. For coagulation purposes the dose of carbon approximates 0.5 ppm, increased to as high as 5.0 ppm for odor control. The daily microscopic examination aids in accounting for sudden changes in chlorine demands; in anticipating increased demands on the filter; in simplifying filter plant maintenance, and in preventing customer complaints.

Roderick W. Campbell—"Microscopic Examination of Water at Lorain, Ohio;" *Taste and Odor Control Journal*, January.

Lining Pipe with Cement

The La Mesa, Lemon Grove and Spring Valley Irrigation Dist., Calif., buys its cast-iron pipe with cement lining. But lining of the fittings is done by the district itself. The fittings are ground smooth with an electric grinder or wire brush. The cement mortar is made with C-9 portland cement and white silica sand passing 30 mesh, mixed to a thick soupy condition, applied to the bottom half of a fitting and smoothed to a minimum over-all thickness of $\frac{1}{8}$". As soon as it is stiff enough to adhere to the iron, the fitting is turned over and the cement applied to the other half. Before the cement has completely set, a Talmetto brush, slightly wetted, is applied around the full circle of the lining to create a smooth, uniform finish. It is then painted with Inertol Standard paint, which fills surface voids and pores and acts as a curative agent for the green cement. The casting is then allowed to cure for a minimum of 10 days to allow the volatiles of the paint to evaporate; otherwise they cause offensive taste and odor to the water. It is contemplated to use, in future work, "Amercoat" paint, which can be used satisfactorily within 12 hr. after application. The cost of applying this lining is about 5% to 8% of the purchase price of the fitting.

M. J. Shelton—"Lining Cast Iron and Steel Fittings;" *PUBLIC WORKS*, February.

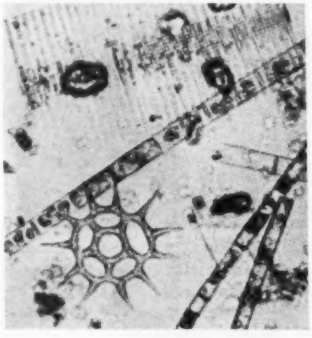
Poliomyelitis and Public Water Supplies

In a report to the (London, England) Metropolitan Water Board, their director of water examination, E. F. W. Mackenzie, stated that, from investigations in England and America, he formed the opinion that "there is no evidence whatever that the virus of poliomyelitis has ever been distributed in a public water supply in sufficient quantity to cause infection or that it is capable of surviving in such quantity, if at all, the purification processes which have in the past been applied to the Board's water;" especially noting the chlorination and, in most cases, superchlorination applied to the river-derived supplies and many of the wells.

"Spread of Poliomyelitis by Public Water Supplies;" *Municipal Engineering*, Jan. 12.

Quaternary Ammonium Salts for Disinfecting Mains

Use of dry hypochlorite powdered, placed in each pipe as laid, falls short of guaranteeing safe water unless adequate precautionary measures are taken. Liquid chlorine is better for main disinfection and chlorine is probably the best all-around disinfecting agent for water from the standpoint of convenience, price and knowledge of toxicity, but there are some applications where other materials appear to be suitable for use. Des Moines uses a mixture of 1 gal. of "Spartec", 15 lb. of "Yellow-Hoop" (both by Wyandotte Chemical Co.) and 20 gal. of water for swabbing out each length of pipe just before it is laid. Many miles of



Courtesy Taste and Odor Control Journal.

● *ALGAE found in Lorain's water Supply.*

new mains have been so treated, and every sample taken in testing afterward has been satisfactory. These quaternary compounds are very readily obtainable in smaller communities and can be used by inexperienced personnel.

M. K. Tenny—"Quaternary Ammonium Compounds for Main Disinfection;" *Journal, Am. Water Works Ass'n*, January.

Disinfecting Tanks and Reservoirs

Tanks and reservoirs should be disinfected before being placed in use. This can be done by adding chlorine compounds directly to the reservoir during filling; this is recommended for tanks of 50,000 gal. capacity and under. Or straight chlorine can be added to the incoming water when the tank is filling which is recommended for elevated tanks of more than 50,000 gal. capacity. A third method, which has been used only during the last few years, is a continuous washing of the walls, floor and roof with a spray containing about 500 ppm of chlorine. This third method is economically advantageous for all tanks or reservoirs of more than 100,000 gal. capacity.

Harry W. Tracy—"Methods of Disinfecting Tanks and Reservoirs;" *Journal, Am. Water Works Ass'n*, January.

Adjusting Treatment to Pollution Loading

Future purification requirements may impose demands beyond the capacity of plants and facilities now provided. But data from six plants demonstrate that the adjustment of treatment to pollution loading can be accomplished in conventional plants using conventional facilities, the treatment differing in degree rather than in type. Long periods of detention and flexible operating facilities constitute important provisions. Where pollution loading is heavy, the use of biological treatment processes (such as are used in treating sewage) preliminary to water treatment processes has already demonstrated its usefulness.

Harry A. Faber—"Adjustment of Water Treatment to Pollution Loading;" *Journal, Am. Water Works Ass'n*, January.

National Water Resources Policy

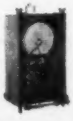
The use of water for public supplies must have first priority over other uses. Public supplies are essentially local community problems,

CHECK LEAKAGE with Simplex Waste-Water Detection Equipment

Breaks in pipe lines or leaking joints have always been an annoying problem to municipal engineers. Not only money but precious water is wasted. That's why it pays to detect the leaks in your water system . . . and there's no easier way to do it than with Simplex portable equipment!

The combination of Simplex pitot rod, manometer and recorder is ideal for checking water wastes and measurement of flow through pipe lines in hard-to-get-at places or where permanent measuring equipment is not installed. Each unit is light in weight and ruggedly designed to withstand the hard treatment of being moved from station to station.

For free Bulletin #50, write to Simplex Valve and Meter Company, Dept. 3, 6750 Upland Street, Philadelphia 42, Pa.



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and should be developed, regulated and paid for by those using the services. Water for industry is obtained from either surface water, underground water, sea water, or water reclaimed from sewage. The average annual rainfall over the country as a whole far exceeds any reasonable predicted demand for municipal and industrial water. Water shortages are due to: 1—Failure to provide for equalization of surface water runoff. 2. Over-concentration of population and industries. 3—Withdrawal of water from underground aquifers in excess of natural recharge. 4—Water wastage. 5—Failure to use available salt water in place of fresh water. 6—Selection of plant sites without adequate evaluation of availability of water for existing or predictable future requirements. 7—Inadequate design and planning of water-consuming processing equipment.

There is need for inaugurating a program including: An inquiry on a national basis of water requirements and water resources available. Data regarding overindustrialization within critical water areas, and the desirability of decentralization of industrial users of large volumes of water. A study of the inter- and intra-state control and regulation of flood waters to provide industrial requirements. Publication of information on salt water usage as a conservation measure. Expanding the activities of state and federal agencies handling critical underground resource problems, of the U. S. Geological Survey and comparable state organizations.

"National Water Policy;" *Journal, Am. Water Works Ass'n*, January.

HOW
TO BUY A VALVE
When you buy a valve, you buy pipe-line control—which encompasses valve design, construction, operation, first cost and maintenance. Purchase-price alone is not the determining factor. Price is relative. A high quality valve having longer life and giving better pipe-line control always is lowest in final cost.
M & H VALVE
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DEPENDABLE SERVICE—
YEAR AFTER YEAR!
Field reports establish the fact that M & H Valves are correctly designed, dependable in operation, with a record of long life and freedom from repair. Engineers recommend M & H Valves on basis of low cost per year of service. Sizes 2 to 30 inch, inclusive, with all standard end connections, including Mechanical Joint.
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Waterworks Re-equipment

As in other industries, old waterworks equipment should be replaced whenever its retention can no longer be justified economically. In the last 20 yr. efficiencies of centrifugal pumps, turbines, internal combustion engines and other items have improved materially. Often power can be purchased for less than the cost of producing it in an isolated plant. Small diesel engines with high efficiencies are now obtainable. In Denison, Tex., 19-yr. old pumps and motors were scrapped and replaced by modern units, and the saving in power paid for them in two years. In Charlotte, N. C., a 14-yr. old and two 25-yr. old centrifugal pumps were replaced with modern ones of more than twice the capacity, and the saving in power more than financed the cost.

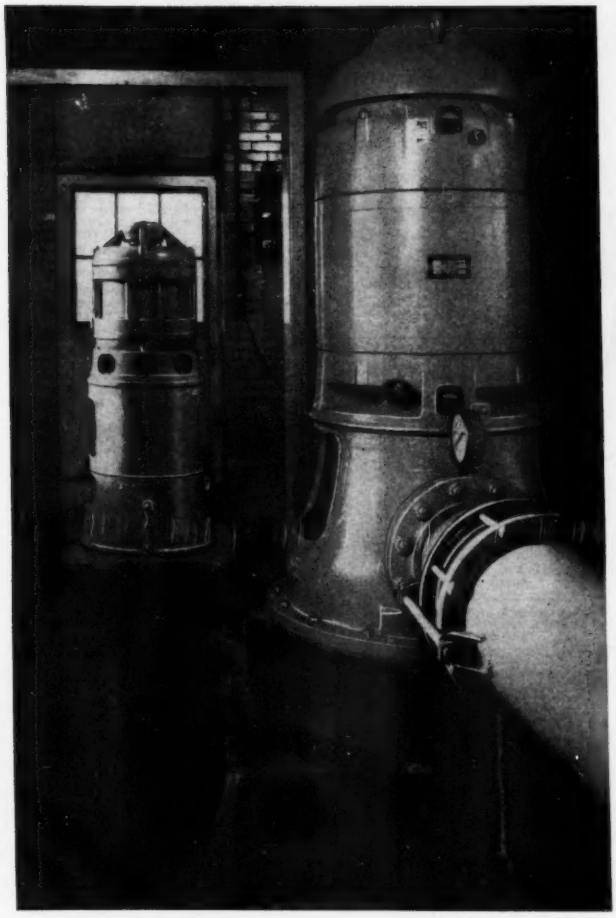
When filters are overtaxed, instead of building more filters it may be more economical to condition the water better before filtering. Where peak loads overtax plant capacity, the answer may be tank storage in the distribution system rather than increasing capacity. Metering may cost less than increasing plant capacities or seeking a source of greater supply. As to conservation of materials, new pumps or other equipment may contain less material than the old plant contributes as scrap metal; and they will use less power or fuel.

W. Victor Weir—"The Need for Water Works Reequipment;" *Journal, Am. Water Works Ass'n*, January.

Effectiveness of Cathodic Protection

There are three general methods for establishing the effectiveness of cathodic protection — (1) Visual evidence of rust-tubercle formation or of pitting; weight loss; pit-depth measurement; leak history; turbid-

BEATRICE, NEBRASKA UPS WATER SUPPLY



The above Layne Well Unit (in background), driven by a 60 H.P. solid shaft motor, was installed in 1931 and has been operating efficiently for almost twenty years.

WITH A LAYNE SHORT SETTING BOOSTER PUMP

FROM four Layne Well Water Units, Beatrice, Nebraska was putting 1600 gallons of water per minute into the city through their six miles of 14 inch mains. Growth of population and new industries created a need for more. The problem was easily, quickly and economically solved by installing a Layne Short Setting Booster Pump in line with the wells. As a result, water supply was increased to 2,380 gallons per minute—nearly 41 percent.

The Layne 2-stage, 15 inch bowl booster pump, powered with a 100 H.P. motor was easily accommodated in a small pump house addition, thus saving the cost of extra heating equipment. Installed in 1948, it is giving highly satisfactory service.

These Layne Short Setting booster pumps may be used by other cities—and factories as a means of increasing water supply at a very nominal cost.

If you are in need of more water either from your present wells, or from new units, Layne engineers will gladly survey your present equipment and make dependable recommendations. For further information, catalogs, etc., address

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Layne

WELL WATER SYSTEMS

VERTICAL *Turbine* PUMPS

LAYNE ASSOCIATED COMPANIES

ASSOCIATED COMPANIES—Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ The Layne-Texas Co., Ltd., Houston, Tex. ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Minnesota Co., Minneapolis, Minn. ★ International Water Corp., Pittsburgh, Pa. ★ International Water Supply, Ltd., London, Ont. ★ Layne-Hispano Americana, S.A., Mexico, D. F. ★ General Filter Company, Ames, Iowa.

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ity in water resulting from active corrosion. (2) Electrical measurements: Raise the metal-water potential to a fixed value, or by a fixed amount; potential-log current density relationship. (3) Chemical: pH of rust tubercle; tubercle anion and cation concentration; iron pick-up in water resulting from active corrosion. Very little work has been reported on the chemical criteria of corrosion control; this paper outlines some practical possibilities of this method. Preliminary studies of the effect of cathodic protection on rust tubercle pH suggest: 1. Active corrosion tubercles have a pH less than 6.5. 2. The pH of the tubercle decreases as the rate of pit penetration increases. 3. The pH of active tubercles is relatively independent of the pH of the bulk of the water. 4. Cathodic protection, when complete, raises the pH of a tubercle above 7.0, and in time the pH should approach 9.0. 5. Measurements of the pH of a rust tubercle provides the corrosion engineer with an additional tool to establish the effectiveness of cathodic protection.

F. J. LeFebvre and L. P. Sudrabin

—"Some Observations of the Effect of Cathodic Protection on Rust-Tubercle pH;" *Journal, New England Water Works Ass'n*, December.

Fluoridation of Public Supplies

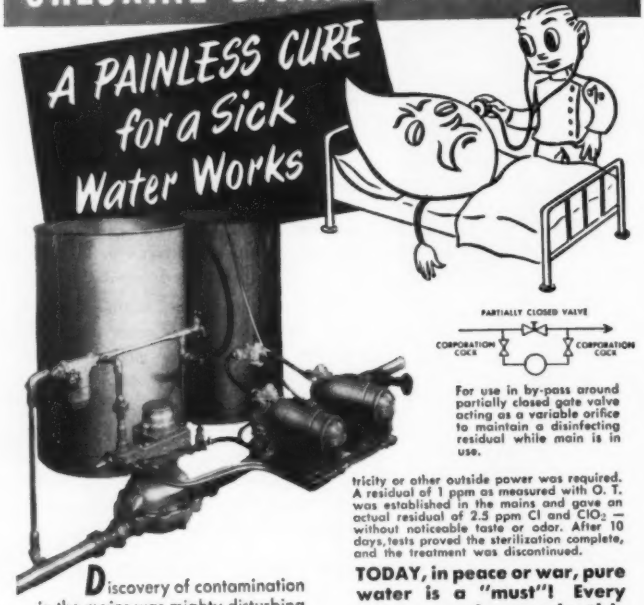
The present judgment of the value and safety of fluoridation of public water supplies is tentative, and to advocate it, except as an experiment, is premature and economically a gamble. And as several experiments are now under way, there seems to be no virtue in adding similar ones. Any additional experiments should be carefully planned as to what is to be proved, the kind of evidence that would be acceptable, the manner of obtaining such evidence, the availability of competent personnel, the cost and whether the money could not be spent elsewhere with more profit. *J. L. T. Appleton.*

The New York State Dept. of Health has considered the Newburgh study as a research project and has not recommended fluoridation of public supplies pending its conclusion. But results at Newburgh and elsewhere have been so favorable that the department has modified its policy and will help to plan a program for communities which, after consultation with their local medical and dental societies, wish to establish this procedure and will place it under the direct supervision of a qualified engineer.

Charles R. Cox—"The Advancement of Fluoridation;" *Journal, Am. Water Works Ass'n*, January.

CHLORINE DIOXIDE TREATMENT

A PAINLESS CURE for a Sick Water Works



For use in by-pass around partially closed gate valve acting as a variable orifice to maintain a disinfecting residual while main is in use.

Discovery of contamination in the mains was mighty disturbing to a certain New England town of 15,000 people, extremely proud of its pure water supply. But the cure was simple and sure — %Proportioneers% Chlorine Dioxide System in ten days entirely eliminated the contamination while the mains were in use. In addition, the chlorine dioxide "saved face" for the water works since the treatment was completed virtually unbeknown to the water users.

TREATMENT: %Proportioneers% hydraulically operated Chem-O-Feeder, complete with Chlorine Dioxide Generator, was easily installed as shown in the diagram. No electricity or other outside power was required. A residual of 1 ppm as measured with O. T. was established in the mains and gave an actual residual of 2.5 ppm Cl and ClO_2 — without noticeable taste or odor. After 10 days, tests proved the sterilization complete, and the treatment was discontinued.

TODAY, in peace or war, pure water is a "must"! Every water works needs this emergency sterilization equipment. % Proportioneers% Chlorine Dioxide System is the ideal unit . . . it's complete, ready for instant use: to sterilize new mains, to eliminate contamination, to meet the emergencies of war. Investigate now, while equipment is still available. Write for bulletins.

% Proportioneers, Inc.% 356 Harris Ave., Providence 1, Rhode Island.

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Winooski's Automatic Filter. By *Joseph F. Leclair*, Supt. of Water, Winooski, Vt. February, Pp. 94-95.

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The Need for Water Works Reequipment. By *W. Victor Weir*, Pres. A.W.W.A. January, Pp. 1-5.

Construction Trends in the Water Works Field. By *Vernon R. Kneer*, Cons. Engr. January, Pp. 6-10.

The Philosophy of Supplementary Treatment of Public Water Supplies in the Interest of Group Health. By *A. P. Black*, Univ. of Florida. January, Pp. 11-16.

The Advancement of Fluoridation. By *H. Trendley Dean*, Dental Director, U.S.P.H.S. January, Pp. 17-23.

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Adjustment of Water Treatment to Pollution Loading. Panel discussion. January, Pp. 31-54.

Evaluation of Stream Pollution. By *L. L. Hedgepeth*, Am. Cyanamid Co. January, Pp. 55-60.

Pollution Control and Property Rights. By John *H. Murdock, Jr.*, Counsel, Am. W. W. Service Co. January, Pp. 61-64.

Cost of Refrigerative and Other Special Services. By *Elwood L. Bean*, Prin. Asst. Engr., Bureau of Water, Philadelphia. January, Pp. 65-81.

Quaternary Ammonium Compounds for Main Disinfection. By *M. K. Tenny*, Asst. Mgr. Water Works, Des Moines. January, Pp. 82-84.
Methods of Disinfecting Tanks and Reservoirs. By *Harry W. Tracy*, Asst. Engr. Water Purif., San Francisco Water Dept. January, Pp. 85-90.

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Softening Plant Has Sea-water Regeneration, and Automatic Control, for Processing. Feb. 1, Pp. 46-48.
Good Land-use Practices Cut Turbidity in River Water. Feb. 8, Pp. 40-43.

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Some Observations of the Effect of Cathodic Protection on Rust Tubercle pH. By *F. J. Le Febvre* and *L. P. Sudrabin*, Electro Rust-Proofing Corp. December, Pp. 309-322.
Power Generation from the Delaware Project. By *George R. Rich*, Cons. Engr. December, Pp. 323-354.
Experiences in the Use of Metaphosphate in Massachusetts. Committee Report. December, Pp. 406-411.

Public Works

Sanitary Supervision of the Houston Water Supply. February, P. 42.
Lining Cast Iron and Steel Fittings. By *M. J. Shelton*, Chf. Engr., La Mesa, Lemon Grove and Spring Valley Irrigation Dist. February, Pp. 46-47.
Dallas Spends Millions for Water Works Improvements. February, P. 52.
Seasonal Conditioning for Your Swimming Pool. By. *J. A. Oldenburg*, Palmer Filter Equip. Co. February, Pp. 55-58.

***The Surveyor* (England)**

Detection and Suppression of Waste of Water. Jan. 26, P. 47.

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Water Supply Developments in 1950. By *W. Victor Weir*, Gen'l Mgr., St. Louis County Water Co. January, Pp. 1-10.
Basic Factors in Centrifugal Pump Application. By *Roy Carter* and *I. J. Karassik*, Worthington Pump & Mach. Corp. January, Pp. 11-16.
Water Treating Experiences at Austin, Texas. By *A. H. Ullrich*, Supt. of Water & Sewage Treat. January, Pp. 17-21.

Water Works Engineering

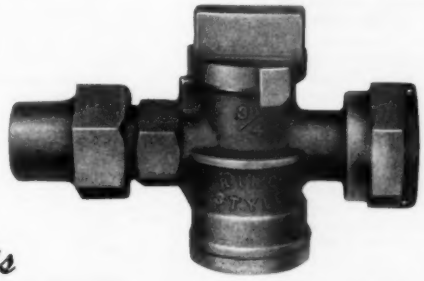
Chester, Pa., Develops a New Water Supply Source. By *Francis S. Friel*, Cons. Engr. January, Pp. 36-38, 66.
Water Resources Development by Federal Agencies Advocated. January, Pp. 39, 68.
Cast Iron and Steel Fittings Cement Lined by Purchaser. By *M. J. Shelton*, Chf. Engr., La Mesa Irrigation Dist. January, Pp. 43-44.
Preventive Metallizing Uses Pounds to Save Tons Later. By *D. A. Watson*, Metallizing Eng. Co. January, Pp. 49, 69.
Metering Apartment Houses. Round Table discussion. January, Pp. 55-56, 79.
Water Supply System at Orleans, France. By *Henry Altimus*, U.T.P.S. February, Pp. 124-126, 165-166.
Validity of Water Works Bonds. By *Leo T. Parker*. February, Pp. 127-128, 158-159.
How Swimming Pools May Pollute Water Supply. By *Frederick O. A. Almquist*, Prin. San. Eng., State Dept. of Health, Hartford, Conn. February, Pp. 133-134.

Sanitary Landfill In A Cold Climate

IN North Dakota there are low temperatures and deep snows. Between November 1949 and May 1950, 86.2 inches of snow fell at Mandan, and the average temperature for January was 10.2° below zero, with a low of —44°. There was some question whether the sanitary landfill method could be employed there successfully; but last winter's experience demonstrated that it could if the details be worked out intelligently. How this was done is described by Leo Weaver, Sanitary Engineer, North Dakota State Department of Health, as follows:

"In early October, the operator of the fill started excavating a trench 300 feet long, 22 feet wide, and averaging 6 feet in depth. Actually, since the trench sloped to original ground level from both directions at the 150-foot mark, there were two trenches. Although this was considered sufficient for a full winter's operation, a third trench was constructed as insurance. This trench was 100 feet long, 25 feet in width, and averaged 6 feet in depth. About 700 cubic yards of dirt from these trenches were stored as cover material for the winter, and the remainder was used for constructing a windrow along the western side of the excavated trenches. The top of the windrow was the intended grade height of the fill. Since this averaged approximately 6 feet above the original ground level at this point, the average height of the fill could roughly be figured at 12 feet.

The stockpiles were placed from 50 to 100 feet from the working area, and piled with steeply sloping



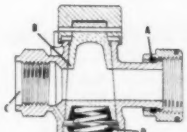
This

METER VALVE

Saves installation costs where space is limited

Permitting "in-line" setting of meters in tight space, the Ford Straight Ringstyle Valve also saves fitting labor and at least one coupling.

This valve enjoys all of the advantages of the famous Ford Angle Ringstyle valve. Note these features: (A) Ringstyle coupling that eliminates a pipe joint as well as a coupling (B) Recessed key that keeps deposits from damaging valve surfaces (C) "Set-in" threads to protect threads of iron pipe and (D) Bronze spring that keeps key in place. No leather gasket required, prolonging valve life.



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sides parallel to the axis of the prevailing northwest wind. The wind kept accumulations of snow off the stockpiles most of the winter. This soil was a sandy loam soil. By laboratory analysis, it consisted of 64.2% sand, 13.5% silt, and 22.3% clay. Its moisture content at excavation was 9.2% and this declined to 4.9% when sampled directly from the stockpile in February.

As a precaution against drifting snow, snow fence was placed parallel to the trenches at approximately 100 feet from the windrow. The combination of the two kept drifting snow in the operating area at a remarkable minimum.

It was found necessary to place snow and ice grousers on the tracks of the tractor which was used to compact the refuse and place the cover.

An idea employed at Willmar, Minn., with success was to protect the area to be used the following winter, from freezing by dumping on it to a depth of 3 ft., wet leaves that were collected from the streets.

Storage Tank On A Man-Made Hill

FINDING in 1948 that increased population made the existing 320,000-gallon storage of its water supply system inadequate, Jamestown, N. D., voted a $400,000 bond issue to provide 2,000,000 gallons additional storage, together with extensions and improvements to the distribution system. The highest near-by location for a storage tank was a hill at the south edge of the city; but this was 40 ft. lower than the level of the existing storage tanks, and an elevated tank seemed necessary. The engineers, Lium and Burdick, prepared alternate plans for an elevated steel tank, and for constructing a reinforced concrete tank on an embankment 40 ft. high. The latter was desired if not too costly, since it could be surrounded and covered with earth, which would practically eliminate difficulties with ice. Bids were received on both plans, and one for the embankment and covered tank was lowest and was accepted. The reservoir was constructed in 1950.

The embankment is about 40 ft. high and has a base diameter of 470 ft., with side slopes of 4 to 1. It was placed in shallow layers and compacted to at least 90% of maximum density. The tank was placed on the top of this embankment, and then surrounded with 38,000 cu. yd. of additional fill which was brought

to an average height of 63 ft. above ground level, high enough to give a minimum of 3 ft. of cover over the tank, and carried down the embankment with a slope of 2½ to 1.

To prevent leakage into the embankment, the top of this was covered with a 4-in. asphalt mat. On this was placed 18 ins. of washed gravel, then 3 ins. of mixed sand and cement, on which the bottom of the tank was poured. Drain pipes were placed in the gravel fill to carry off any possible leakage, and a concrete curb built on the asphalt mat, surrounding the tank and 1 ft. away from it, to prevent possible leakage from reaching the embankment. The tank is 132 ft. in diameter and 22 ft. high. The floor and walls are 1 ft. thick, and the roof is an 8″ slab supported by columns.

The above is condensed from an article in the *Official Bulletin*, of the North Dakota Water & Sewage Works Conference, by Erik Peterson, City Engineer of Jamestown.

Phenol Waste Treatment by Chlorination

A process for the removal of phenols from phenol-bearing wastes, where the phenol content does not exceed 200 ppm, has been announced. This treatment is of great importance where these concentrations are not permissible in the plant effluent and must be completely eliminated.

Chlorination of the phenol-bearing effluents is the basis of the process. For most economical results, the ammonia content of the liquor should be less than 50 ppm. Under such conditions, it has been found that 10 ppm of chlorine is necessary for the destruction of each 1 ppm ammonia. In the case of the phenols alone, an additional 10 ppm of chlorine is required for each 1 ppm of phenols provided they are oxidized to carbon dioxide and water. Cyanide, if present, is converted to ammonia and carbon dioxide with an additional chlorine dosage of 8 ppm per 1 ppm cyanide. The overall chlorine requirement increases in proportion to the amount of additional organic matter that may be present. Experience has shown that the temperature of the effluents thus treated should be less than 100°F.

The value of a successful process such as this is obvious. Further work is in progress and additional information on methods of treatment will be available shortly.—*Chlorination Topics.*

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(*Continued from page 42*)

for the construction. The contract provided for a turnkey job, ready for operation at a lump sum price of $331,762. The contract was awarded on the basis of the contractor furnishing clarifier and filter equipment manufactured by Infilco, Inc., and pumping equipment manufactured by Fairbanks-Morse.

Construction was started by the contractor on November 12, 1948. The work was substantially completed on December 1, 1949. Test runs of the plant were conducted during the month of December and the plant was placed in full operation in January, 1950.

As the contract provided for certain guarantees, as far as the equipment was concerned, arrangements were made with the manufacturer of the equipment, the City, and the Consulting Engineers to maintain a careful check of plant operating data. It was agreed by all parties that representatives of the manufacturer of the equipment and the Consulting Engineers would assist the superintendent of the water works for a period of six months in the operation of the plant and the maintenance of plant records. This operational check was completed at the end of July and indicated that during the six month's period all equipment guarantees had been fully met. It was fortunate that during this period the turbidities of the raw water ranged between 500 ppm and 3800 ppm. At all times during the test period the range of turbidity of water to the filters has been between 4 and 15 ppm. During the first three months of operation, the presedimentation basin was used in series operation with the clarifier unit. As the operation results during this period were much better than anticipated, it was decided to try a test period of operation without the presedimentation basin. The performance obtained without the use of the presedimentation basin was within the limits indicated above. We feel, however, that the additional investment for the presedimentation basin is fully justified as the benefit of using this basin during extreme raw water conditions has been proven; and, in addition, it provides standby equipment for emergency use. Six months of operational test runs have clearly indicated that the City has a plant which will produce water of a quality desired and at a low operating cost.

PUBLIC WORKS EQUIPMENT *News*

Improved Refuse Loader

A new Pax-all refuse loader is available with capacities of 9 and 12 cu. yds. Increased load capacities are provided by the new body design so that both bodies will fit

Pax-All 9 to 12-yd. body.

trucks of 84 ins. cab to axle dimension. Bucket size has been increased. All operations of loading, packing and dumping are powered by one double-acting hydraulic cylinder. Full data from St. Paul Hydraulic Hoist, Gar Wood Industries, 2207 University Ave., S. E., Minneapolis, Minn., or by using the coupon.

Use coupon on page 93; circle No. 3-1

Heavy Motor Grader for Fast Work

The new 104 motor grader, announced by Galion, has six forward and two reverse speeds, all operated by one lever, with speeds of 1.1 to 20.1 mph. High reverse gives 8.4 mph, permitting fast operation without turning. This is especially desirable where space may be limited. Hydraulic shiftable moldboard is available as extra equipment. For full data and a complete list of advantages of this model write Galion Iron Works & Mfg. Co., Galion, O., or use the coupon.

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This is an electrically driven unit with a wide variety of uses in trimming the edges of lawns, trees, hard-to-get-at places, shrubbery and vines. This is a pretty nice tool for doing certain phases of roadside work, and for parks, playgrounds and municipal golf courses, where it could help to get rid of some of that undesirable rough. Data from Electric Sprayit Co., Sheboygan, Wisc., or by using the coupon.

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Oliver-Ware hydro trencher.

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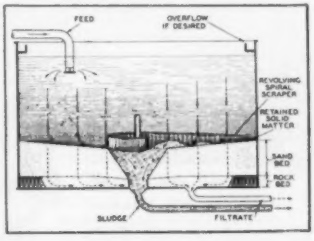
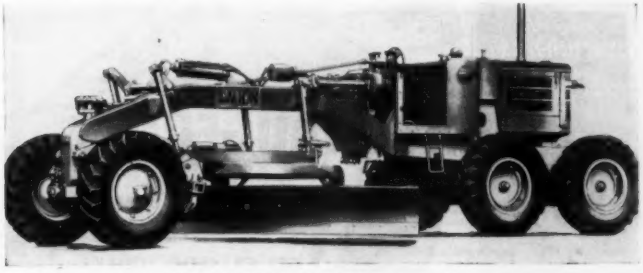


Hardinge filter-clarifier.

can be used. This is not a backwash filter, but uses a spiral scraper to take a thin cut off the top of the sand bed when the filter rate decreases. Depending on the kind of waste, application rates vary from 1/30 to 1 gal. per sq. ft. of filter surface per minute. Under usual conditions, the sand surface is cleaned every 8 to 24 hours. Local sand can be used for the filter. A 4-page



This is the Galion No. 104 motor grader.

booklet gives considerable operating data and design information. Sent on request to Hardinge Co., Inc., 240 Arch St., York, Pa., or by using the coupon.

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Adjusting chlorine feed.

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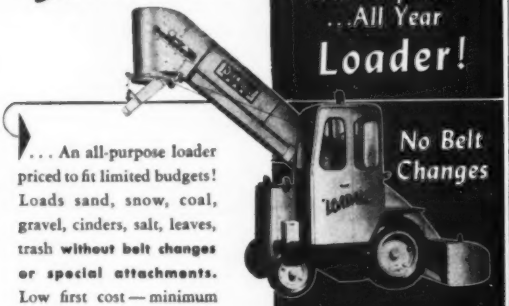

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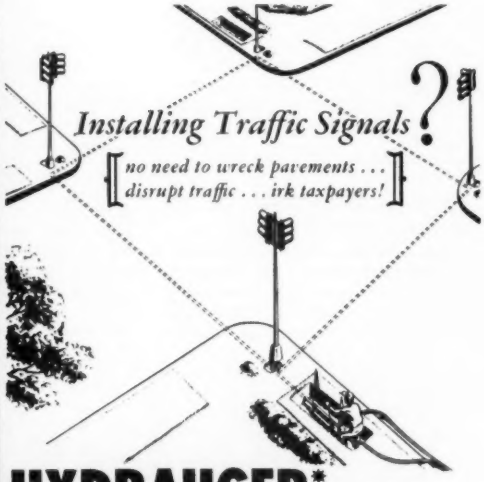

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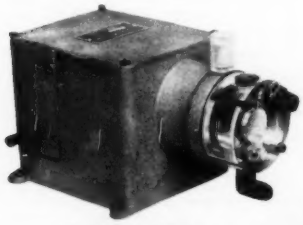

Small hypochlorinator

gear train are immersed in oil; the pump head and plunger are of plastic and quartz. Complete details from Precision Machine Co., 5 Union Square, Somerville 43, Mass., or by using the coupon.

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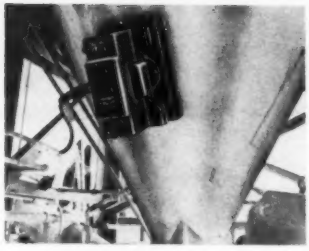

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In this hoist, power for lifting the load is taken from the truck engine through a power take-off, a speed reducer and a worm and gear set. A wide range of capacities is available. Many kinds of everyday work can be performed with this hoist—it can lift manhole covers and catch basin grates, and do other similar work. The high dumping angle assures clean discharge of trash and leaves. Information from Detroit Mechanical Hoist Corp., 3502 West Fort St., Detroit 16, Mich., or by using the coupon.

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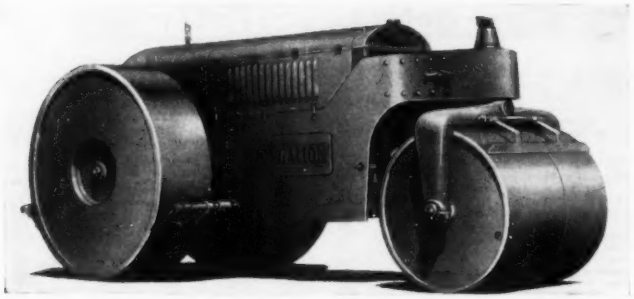

Galion heavy variable weight roller.

Variable Weight 3-Wheel Rollers

Variable weight 3-wheel rollers are now available from Galion in six to 12-ton weights. The newest addition comes in 10 or 12-ton sizes. The rolls are steel drums, which can be filled with water. Rolls can be equipped with mats and sprinklers and can be furnished in 20 or 24-inch widths. Engine may be diesel or gasoline. Many refinements for better and easier operation are available. Full data from Galion Iron Works & Mfg. Co., Galion, O., or by using the coupon.

Use coupon on page 93; circle No. 3-15

Electronic Traffic Signals

Electronic traffic signals that adjust to variations in traffic flow are being installed on one of the main traffic arteries in Houston. One of the signals mounted at a school intersection will also be manually controlled at times when school children are crossing the streets. —*Public Management.*

Seminar for European Sanitary Engineers

The first seminar for European sanitary engineers was held at The Hague, Netherlands, Nov. 27 to Dec. 2, under the sponsorship of the World Health Organization and the International Health Division of the Rockefeller Foundation. The seminar was attended by 40 sanitary engineers from 16 European nations. Carried out under the direction of Herbert Bosch, chief of the Environmental Sanitation Section of the WHO, and Prof. H. G. Baity, sanitary engineering consultant, this meeting provided an important contact ground for sanitary engineering personnel throughout all of Europe.

Accurate Altimeter Developed by Army

A surveying altimeter accurate to within two feet has been designed and tested by Army's Engineer Research and Development Lab. at Ft. Belvoir, Va. Design features an aluminum housing, low level interior humidity by use of silica gel desiccant, and night lighting supplied to altitude scale by lucite reflector rod. The instrument is an aneroid type barometric leveling device for use up to 15,000 feet above sea level. Details are available from Technical News Letter, 2C-765, The Pentagon, Washington, D. C.

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INDEX OF ADVERTISEMENTS

Albright & Friel, Inc.	84
Allis-Chalmers Tractor Div.	11
Alvord, Burdick & Howson	84
Amman Photogrammetric Engrg., Jack	20
Atlas Mineral Products Co.	64
Ayer-McCarel-Reagan Clay Co.	25
Baker, Jr., Michael	84
Baldwin-Lima-Hamilton	12 & 13
Bannister Engineering Co.	84
Barker & Wheeler	84
Barrett Division	77
Black & Veatch	84
Blaw-Knox Div.	72
Bogert Assoc., Clinton L.	84
Bowe, Albertson Assoc.	84
Bowerston Shale Co.	25
Brown, Francis L.	84
Brown Engineering Co.	84
Buck, Seifert & Jost	84
Builders Providence	68
Burgess & Nipple	84
Burns & McDonnell Eng. Co.	84
Caird, James M.	84
Capital Engineering Corp.	84
Caterpillar Tractor Co.	14 & 15
Chemical Insecticide Co.	74
Chicago Bridge & Iron Co.	59
Chicago Pump Co.	3
Chester Enngineers	85
Clark-Wilcox Co.	91
Clarke Gardner & Assoc.	85
Cleveland Trencher Co.	69
Climax Engine & Pump Mfg. Co.	71
Cole & Son, Chas. W.	85
Consoer, Townsend & Assoc.	85
Continental Steel Corp.	64
Corson, Oscar	85
Darley & Co., W. S.	90
DeLeuw, Cather & Co.	85
Dempster Brothers, Inc.	61
Dickey Clay Mfg. Co., W. S.	25
Dolge Co., C. B.	89
Dow, A. W., Inc.	85
Dratt Mfg. Corp.	8 & 9
Fairbanks-Morse & Co.	24
Federal Enterprises, Inc.	31
Fisher Research Lab., Inc.	90
Flexible Sewer-Rod Equipment Co.	70
Foote Co., Inc.	30
Ford Meter Box Co.	83
Frink Sno-Plows, Inc.	94
Galion Iron Works & Mfg. Co.	2
Gannett, Fleming, Corddry & Carpenter, Inc.	85
General Electric Co.	10
General Filter Co.	92
Gieseke, Geo. A.	85
Gilbert Associates, Inc.	85
Globe Phone Mfg. Corp.	92
Greeley & Hansen	85
Green Co., Howard R.	85
Griffin Wellpoint Corp.	17
Harshaw Chemical Co.	65
Harte Co., John J.	85
Hellige, Inc.	96
Heltzel Steel Form & Iron Co.	75
Hill & Hill	85
Hitchcock & Estabrook	85
Holmes Co., Ernest	19
Homelite Corp.	63
Hough Co., Frank G.	34
Hydrauger Corp., Ltd.	88
Hydraulic Development Corp.	92
Infilco, Inc.	57
International Harvester Co.	8 & 9
Irving Subway Grating Co.	97
Jaeger Machine Co.	95
Jeffrey Mfg. Co.	67
Johns-Manville	32 & 33
Jones, Henry & Schoonmaker	85
Kennedy, Clyde Co.	86
Knowles, Inc., Morris	86
Layne & Bowler, Inc.	81
Lewis, Harold M.	86
Littleford Bros., Inc.	28
Lock Joint Pipe Co.	99
Lozier & Co., Wm. S.	86
M & H Valve & Fittings	80
Metcalf & Eddy	86
Motorola, Inc.	27
Murdock Mfg. & Supply Co.	98
National Clay Pipe Mfrs., Inc.	29
National Fireproofing Corp.	25
Nelson Iron Works, N. P.	88
Oliver Corp.	4
Pacific Flush Tank Co.	94
Palmer & Baker, Inc.	86
Palmer Filter Equipment Co.	90
Permutit Co.	21
Pfeifer & Schultz	86
Phelps Inc., Boyd E.	86
Pirnie Engineers, Malcolm	86
Pitometer Company	86
Pomona Terra-Cotta Co.	25
Precision Machine Co.	90
Pressure Concrete Co.	64
Public Works	26 & 72
Proportioneers, Inc.	82
Quinn Wire & Iron Works	72
Ridge Tool Co.	22
Robert & Co.	85
Roberts Filter Mfg. Co.	98
Roots Connersville Blower Corp.	18
Russell & Axon, Cons. Engs.	86
Scott & Sons Co., O. M.	64
Simplex Valve & Meter Co.	79
Skinner Co., M. B.	6 & 95
Smith & Gillespie	86
Sparkler Mfg. Co.	60
Stanley Engineering Co.	86
Standard Steel Works	76
Stilson Assoc., Alden E.	86
Taylor, Henry W.	86
Taylor & Co., W. A.	95
Tennessee Corp.	58
Texas Vitrified Pipe Co.	25
Trickling Filter Floor Institute	25
United Laboratories, Inc.	89
Wallace & Tiernan Co., Inc.	Back Cover
Wertz & Assoc., Emerson D.	86
Wolverine Tube Division	23
Wood Co., R. D.	62
Worthington Pump & Machinery Corp.	16

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NEW LISTINGS

Excellent Booklet Shows Aerial Mapping Technique

27. A clear explanation of the technique of aerial topographic map production is given in "Air Speeds Your Map Needs." Striking photographs trace aerial photos step-by-step to the final maps for highway location, city and regional zoning and planning, traffic studies, drainage and watershed projects, tax maps and many other types of work. Use the coupon to get this excellent booklet for public works and planning officials. Jack Ammann, Photogrammetric Engineers, 829 N. St. Mary's St., San Antonio 2, Texas.

Your Dump Truck As a Complete Working Unit

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

How to Beat The Weed Problem

66. Be sure to investigate weed control with selective chemical weed killers that get roots and all. Send in coupon today for bulletins on Dolge products that will rid roadsides, parks and lawns of the weed nuisance. C. B. Dolge Co., Dept. PW, Westport, Conn.

Using Sewage Sludge Gas For Power Generation

90. Faribanks-Morse dual fuel engines can operate on either sludge gas or oil to provide steady power output despite fluctuations in gas supply. Bulletins are available on several sizes to meet your needs. Write, giving exact requirements to Fairbanks, Morse & Co., Dept. PW, 600 So. Michigan Ave., Chicago 5, Ill., or use handy coupon.

Helpful Data on Distributors For Bituminous Materials

104. Two models of pressure distributors featuring uniform pressure and temperature, accurate displacement pumping and fast loading are covered in Bulletins RS 31549 and RS 12046, available from Standard Steel Works, Dept. PW, North Kansas City, Mo. Check the coupon to request your copies.

Precise pH Control And Water Tests

117. A new 12-page catalog No. 600-10 illustrates and describes the Hellige Colorimetric Comparator line which ranges from the inexpensive Simplex Testers to the versatile Pocket and Standard Comparators, and the Aqua Tester. All models are equipped with color plates, or color discs, containing proved Non-Fading Glass Color Standards, and many new standards are now offered for the latest tests employed in analyses of water, sewage, and industrial waste. The catalog also introduces the Hellige Daylite Comparator Illuminator for determinations in both artificial and day light. Write to Hellige, Inc., Dept. PW, 3718 Northern Blvd., Long Island City 1, N. Y., or use coupon.

Case Histories on Sidewalk Resurfacing

121. A very interesting brochure dealing with sidewalk resurfacing and waterproofing shows how easily-applied "Plastic Rock" asphaltic concrete produces an attractive, non-skid wearing surface. Use the coupon for full information. United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12, Ohio.

Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Both gasoline and electric models are discussed, and requirements outlined for many applications. Just check the coupon for your copy. The Homelite Corp., 2103 Riverdale Ave., Port Chester, N. Y.

Thinking of Sanitary Landfills? Get This Booklet Now

131. One of the most informative descriptions of the sanitary landfill method of garbage and refuse disposal is presented in Caterpillar's 16-page booklet "A Look to the Future with Sanitary Landfill." The booklet is designed to serve as a guide to proper site selections, the choice of the right equipment to do the job, and the actual operations of sanitary fill. Pictorial treatment shows how and when to start such a program, what to look for in a site, benefits received by the community, and other important considerations. Published by the Caterpillar Tractor Co., Peoria 8, Ill. Check the coupon for your copy.

Manual on Retaining Wall Design

160. Embankment stabilization with Armco Bin-Type Retaining Walls is discussed in a 16-page illustrated booklet offered by Armco Drainage and Metal Products, Inc., Middletown, Ohio. Included are case histories which show embankments along highways, lakes, streams and city streets. Technical data covers selection of design and units required for various sections, curves and grades. Use the handy coupon.

New Data on Airfields

165. Information on airfield planning, construction, paving and maintenance are found in the newly-published Bitumels "Airfields" bulletin. Subjects include location and planning; mixtures for low-cost yet durable construction, surface treatments and paving; CAA airport construction; and other related topics. Use the coupon to request your copy of this well-planned booklet. American Bitumels Co., 200 Bush St., San Francisco 4, Calif.

Helpful Data on Well Water Systems

173. A comprehensive, 48-page book on Layne Water Well Systems covers gravel wall wells, underreaming, cemented walls, rock wells and other well types. Applications of shutter screens and vertical turbine pumps are shown, together with water treatment and conditioning equipment. Ten pages are devoted to useful engineering tables and measurement data. Check the coupon today or write Layne & Bowler, Inc., Dept. PW, Memphis 8, Tenn.

Facts and Figures Handbook

182. The pocket-size edition of "Facts and Figures", published by Pioneer Engineering Works, Inc., Minneapolis 13, Minn., has 62 pages of tables and diagrams covering a wide variety of frequently used engineering data plus comprehensive information on belt conveyors, aggregate specifications, crushing and screening. Check the coupon for your copy.

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Enterprises, Inc., 8733 So. State St., Chicago, Ill., by using coupon.

Portable Electric Generators For Emergency Power and Light

103. Trailer-type diesel-electric generators are playing an important role in current civil defense programs. Griffin describes portable units ranging from 2KW to 12.5KW. Bulletin also includes stationary generators from 4KW to 31.5KW. Griffin Equipment Corp., 881 E. 141st St., New York 54, N. Y. Use the handy coupon to request copy of this bulletin.

Bucket Loaders for All Materials Handling

132. Wheel- or crawler-mounted bucket loaders, 3 to 4 cym capacities are described in Form 501 issued by N. P. Nelson Iron Works, Inc., Clifton, N. J. Use the coupon today for full data on these versatile machines.

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20	24	27	33	34	35	39	40	41	43	44	46	48	49
52	54	57	58	64	65	66	67	71	73	75	76	77	79
80	81	86	89	90	97	102	103	104	106	107	109	111	113
117	121	122	123	129	130	131	132	134	135	140	143	144	146
147	150	151	152	153	155	158	160	162	165	166	173	175	176
178	181	182	186	188	190	191	192	193	196	197	198	201	204
214	224	226	229	231	236	243	301	302	303	304	305	306	307

New Products, pages 87-91:

3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11
3-12	3-13	3-14	3-15							

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How Load-Packers Reduce Refuse Collection Costs

196. The sequence of operation for fast loading and refuse compression in the Gar Wood "Load-Packer" is illustrated and described in 8-page folder M 60, which also provides size data and details of hydaulic equipment. Be sure to check all features of the efficient Load-Packer system. Check coupon or write Gar Wood Industries, Wayne Div., Wayne, Mich.

Steel Flooring Bulletin Helps Designers

198. A 16-page bulletin on several types of "Tri-Lok" open steel flooring and safety steps shows the designer many applications in pumping stations and treatment plants, sidewalk gratings, street expansion joints and bridge floors. Full information on safe loads and fastening devices is included. Get A.I.A. File No. 14-P-21 now by checking coupon. Dravo Corp., Machy. Div., 5th & Liberty Aves., Pittsburgh 22, Pa.

CONSTRUCTION EQUIPMENT

Speed Your Work With These Powerful Motor Graders

48. Two powerful Galion motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

Handbook of Contractors Pumps Is Easy to Use

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58. Check this number on the coupon for colorful circular showing new Ford Trucks for every hauling need, available in great variety of standard, factory-built chassis and body combinations. Be sure to check these trucks on your job. Truck and Fleet Sales Dept., Ford Motor Co., Dearborn, Mich.

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Versatile Wheeled Tractor Handles Countless Jobs

204. A new booklet on industrial wheeled tractors recently published by The Oliver Corp. covers the complete Oliver line. Many application photos show use of tractors with matched allied equipment such as bucket loaders, maintainers, plows, mowers, brooms, etc. Get this bulletin, Form A-918, from The Oliver Corp., 19300 Euclid Ave., Cleveland 17, Ohio.

STREETS AND HIGHWAYS

Get Data Now On This Catch Basin Cleaner

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of equipment for black top road construction and maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use coupon for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

Latest Bulletins on the Hough "Payloader"

107. Carrying dirt and backfill, loading snow, grading and bulldozing are a few of the many jobs quickly handled by public works departments that use Hough "Payloaders". Several models having bucket sizes from 12 cu. ft. to 1½ cu. yds. are offered. Check them all to see which is best suited for your jobs. The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Ill.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept., PW, Warren, Ohio.

Black-Top Paver Offers Many Advantages

150. The flexible Adnun Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Versatile Maintainer Has Year 'Round Usefulness

151. A new bulletin shows how the sturdy Huber Maintainer will work for you the year 'round on maintenance jobs, berm leveling, road planing, bull-dozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber Manufacturing Co., Dept. PW, Marion, Ohio.

How You Can Improve Your City's Street Cleaning

162. The Austin-Western Model 40 sweeper features three wheel design, front wheel steer, for easy maneuvering; rear broom to sweep dirt and refuse directly into 2-yd. hopper; built-in flushing device. Diagrams showing all operations and full specifications in Bulletin AD-2042, issued by Austin-Western Co., Aurora, Ill.

Useful Data for Highway Builders In Barrett Road Book

190. The latest edition of "The Barrett Road Book" has 54 pages of helpful tables and step-by-step outlines of highway maintenance and construction with Tarvia and Tarvia-lithic. Tables show quantities per yard and mile, aggregate gradings; costs; many others. Get this useful book from Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

How to Get Good Grass for Roadside Shoulders

193. For every step in lawn care and seasonable maintenance hints be sure to read "Lawn Care," an interesting periodical sent without obligation by O. M. Scott & Sons Co., 76 Spring St., Marysville, Ohio.

Two-Way FM Radio Telephone Equipment for All Departments

197. The benefits of two-way radio communication for all departments of municipalities and counties make full information on this subject important to all engineers. For descriptions of Motorola FM systems, or for specific recommendations concerning your application write to Dept. PW, Motorola, Inc., 4545 Augusta Blvd., Chicago 51, Ill.

WATER WORKS

How to Keep Trenching Jobs on Schedule

24. The easy maneuverability of the tough, compact Cleveland Model 95 "Baby Digger" makes it well suited for the difficult job of trenching past the many obstacles of city and suburban work. Multiple digging and crawler speeds handle all soil types and trench widths up to 24". Get Bulletin S-52 from Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

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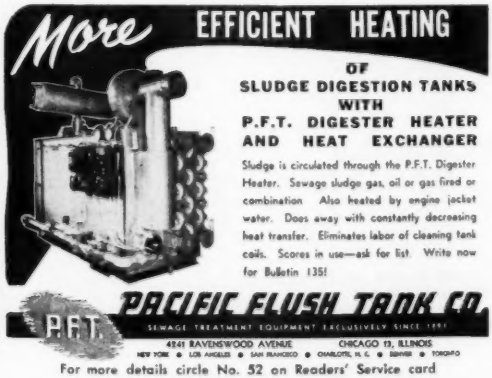
33. 100% metering as practiced by many cities requires accurate, dependable meters with interchangeable parts. Cut-away views of every part, capacity and size data are all included in handsome American-Niagara water meter booklet available from Buffalo Meter Co., 2920 Main St., Buffalo 14, N. Y.

Data on Modern, High-Rate Water Treatment Plant

40. This handsome 28-page bulletin gives a comprehensive yet understandably written story of the development of the Accelator, and explains its principles, advantages, design considerations, operation and applications. Helpful flow diagrams and specifications. For a copy use the coupon or write Infilco Inc., Box 5033, Tucson,, Ariz. Ask for Bulletin 1825.

For more details circle No. 21 on Readers' Service card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Sludge is circulated through the P.F.T. Digester Heater. Sewage sludge gas, oil or gas fired or combination. Also heated by engine jacket water. Does away with constantly decreasing heat transfer. Eliminates labor of cleaning tank coils. Scores in use—ask for list. Write now for Bulletin 135!
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Engineering Data on Diatomite Filters

44. Detailed information and typical plans of Sparkler diatomite filters for swimming pools of municipal water systems is available to engineers and municipal officials. These filters feature self-cleaning filter elements which cuts wash water to a minimum. Get this material now by using coupon. Sparkler Manufacturing Co., Mundelein, Ill.

Helpful Data on Hydrants

64. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M. & H. Valve & Fittings Co., Dept. P.W., Anniston, Ala.

Cast Iron Pipe and Fittings For Every Need

65. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Dept. PW, Burlington, N. J.

Turbidity, Color and Hardness Removal

77. Modern water pre-treatment with Dorr equipment and methods is described in Bulletin No. 9141, which gives basic design data and flowsheets for pre-treating highly turbid water, color removal or treatment of low turbidity, and softening. Typical analyses for various types of waters are given together with detention times in recommended treatment units. Write The Dorr Co., Dept. PW, Barry Pl., Stamford, Conn.

Now You Can Actually See Your Chlorine Residual

79. By using the Wallace & Tiernan residual chlorine recorder you can get better chlorination control because you actually see at all times the residual being carried. The 24-hour charts provide a valuable record and check on operating irregularities. More data on what the recorder is and what it does are covered in Bulletin M-20-S. Wallace & Tiernan, Dept. PW, Newark 1, N. J.

Factors to Consider in Elevated Tank Selection

80. An interesting discussion of the factors to be considered for selection of elevated steel tanks for modern water storage, standard capacities and sizes, required fire flows and other useful data are included in a bulletin on elevated water storage published by Pittsburgh-Des Moines Steel Co., Neville Island P. O., Pittsburgh 25, Pa.

Speedier, Space-Saving Purification Apparatus

81. A new 12-page bulletin, No. 2204, tells how the Spaulding Precipitator, in removing impurities from a liquid by precipitation, adsorption, settling, and upward filtration, occupies less space, uses less chemicals and speeds up treatment. Permutit Co., 330 West 42nd St., New York 18, N. Y.

Cement Lining for Smaller Diameter Water Lines

89. Water lines from 4" to 12" diameter are now cement-lined in place by Centriline Corp., using the Tate process. Catalog C-50 tells how this operation gives new pipe performance to old lines, and shows just how the work is done. An interesting folder, well worth studying. Check coupon for your copy. Centriline Corp., 140 Cedar St., New York 6, N. Y.

Data on Pneumatic Gauges For Water Works

97. Be sure to investigate pneumatic water works gauges of the type used in many of the nation's most modern water treatment plants. Data offered in Bulletin 285-G1 describes pneumatic transmitting and receiving units, their applications, the summation of several flows, and other features. Typical filter control installation is diagrammed. Check the coupon or write Builders-Providence, Inc., 356 Harris Ave., Providence 1, R. I.

Tested Jointing Materials

102. "Hydrotite" is a self-caulking, self-sealing joint compound for bell and spigot pipes. For data book and sample write Hydraulic Development Corp., 50 Church St., New York, N. Y.

Lay bigger tonnage, yet cost 50% less

Up to 12" thickness in widths to 11', lesser thicknesses to 12'6"

JAEGER Paver-Type Aggregate Spreaders

Cost half the price of bituminous pavers. Efficiently lay both base and surface aggregates, free-flowing bituminous mixtures, plant-mixed stabilized soil. Crawler or 4-wheel drive operates on subgrade, not on new-laid material. Two models, to work with all sizes of trucks.

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PERMANENTLY GUARANTEED COLOR STANDARDS

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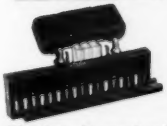

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There's no danger of mechanical inaccuracy when you use a Taylor Comparator for determining pH or chlorine content of water, sewage or industrial wastes . . . *because all Taylor liquid color standards carry an unlimited guarantee against fading.*

One sturdy plastic slide houses all color standards necessary for any one determination . . . and you need only one base for any number of slides. Each set is complete with slide, base and accessories. They're accurate, easy to operate, sturdy. And the cost is low!

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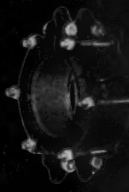
SKINNER-SEAL Bell Joint Clamp for stopping bell and spigot joint leaks under pressure. Gasket is completely sealed: at bell face by Monel Metal Seal band—at spigot by hard vulcanized gasket tip.

AND BROKEN MAINS

SKINNER-SEAL Split Coupling Clamp. One man can install in 5 to 15 minutes. Gasket sealed by Monel band. Tested to 300 lbs. line pressure. A lasting repair. 2" to 16" incl.



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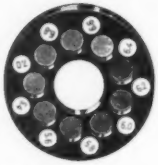

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For more details circle No. 117 on card.

WATER WORKS (Cont.)

Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, list of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., Box 269, East Orange, N. J.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

Get Data on Expansion Joints for Pipelines

113. Expansion joints by Dresser for steel pipe of 3" to 24" diameter are offered in four types—single-end and double-end, with or without limited movement. All types provide deep packing chambers, long followers for generous take-up allowance. Get folder today by checking coupon. Dresser Mfg. Div., Bradford, Pa.

How Elevated Water Tanks Can Save on Operating Costs

134. Beautiful new booklet on Horton elevated steel water tanks suggests ways to reduce pumping costs, increase capacity of systems, maintain uniform pressure, etc. Illustrates 7 models of welded, ellipsoidal-bottom, elevated steel tanks in full color. Write Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Easily Cleaned, Long Run Filter Bed Media

140. Bulletins on Anthrafilt tell the reasons why selected, graded crushed anthracite is superior to sand as a filtering material. Have you made a full investigation? Write Anthracite Equipment Corp., Wilkes-Barre, Pa.

Rehabilitation for Your Water System

153. Whether your water supply system requires a complete rehabilitation program including an engineering survey, hydraulic analysis, reconditioning and related construction, or merely pipe cleaning and coating, it is wise to plan your campaign without delay. Get full data now on the requirements to put your system in top condition. Write Pittsburgh Pipe Cleaner Co., 133 Dahlem St., Pittsburgh 6, Pa., or check handy coupon.

What You Should Know About Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

Handy Calculator for Cast Iron Pipe

175. With the handy Cast Iron Pipe Calculator you can determine at a glance the class, weight and dimensions of bell and spigot pipe. This slide-rule type calculator is absolutely free. Use coupon or write R. D. Wood Company, Public Ledger Bldg., Philadelphia 5, Pa.

Precision Chemical Pump For Hypochlorination

181. Bulletin PM-11 describes the Model AP Precision chemical pump for accurate feeding of hypochlorites or other corrosive liquids used in water treatment. Applications include hypo-chlorination for swimming pools, camps, hotels and small municipal supplies where chemical feed is from 1 to 20 gallons per day. Precision Machine Co., 5 Union Sq., Somerville 43, Mass.

Locate Mains and Services Without Digging

186. A 16-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes and valves by electronic means. Proper manipulation also determines depth of cover. Battery operated unit is readily carried by one man. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif.

How Your Filter Washing Can Be Improved

188. More thorough sand washing with the elimination of mud balls and cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by the Palmer Filter Equipment Co., P. O. Box 1655, Erie, Pa.

Does Your Water Works Have Standby Power?

224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., 208 So. La Salle St., Chicago 3, Ill.

Investigate This Compact Flow Meter for Water

226. The Foster "Flow Tube" is a new metering element that is compact and easy to install. Bulletin FT illustrates simple element containing nozzles for differential pressure production and shows capacity range and accuracy. Made in standard type sizes. Foster Engineering Co., Union, N. J. will send copy, or use coupon.

Are You Ready Now To Make Main Repairs?

214. Broken water mains can quickly be repaired when you have "Skinner-Seal" Split Coupling Clamps on hand. Get Skinner Catalog 41 now—this handsome 40-page book shows how to make every type of pipe repair and covers a complete line of clamps to do the job quickly and easily. Just check the handy coupon for your copy. M. B. Skinner & Co., So. Bend 21, Ind.

Helpful Data on Main Sterilization

231. This detailed discussion of main and emergency sterilization indicates standard procedure, shows how to calculate quantities of sterilizing solution, describes equipment and gives typical specifications. All calculations can be solved by use of a simple chart. Use coupon to get your copy of Bulletin SM-9365. Proportioneers,, Inc., 356 Harris Ave., Providence 1, R. I.

Learn About Alkalinity Control With Blended Softened Waters

236. A new 8-page bulletin (No. 5037) is available which offers a clear description of alkalinity control by blending sodium and hydrogen zeolite softened waters, and shows the advantages of this treatment for industrial and municipal applications. Included are flow diagrams and discussion of the chemical reactions. Use coupon for your copy. General Filter Co., 923 Second St., Ames, Iowa.

REFUSE COLLECTION AND DISPOSAL

How to Lower Costs Of Refuse Collection

35. For saving trucks, labor and time in city rubbish collection get details of the new Dumpster-Kolector described in literature just published by Dempster Bros., Inc., 931 Dempster Bldg., Knoxville 17, Tenn.

20 Questions and Answers On Sanitary Landfill

75. The advantages of sanitary landfill, factors in site selection, kind and size of equipment needed, capacity of a given site and other important engineering considerations are discussed in Form 1084 prepared by the Trackson Co., Milwaukee 1, Wis. Check the coupon for complete information on this refuse disposal method.

Efficient Material Handling to Reduce Incineration Costs

130. Blaw-Knox Buckets specially designed for refuse and garbage handling are described

in 22-page Bulletin 2247. Illustrations show progress of material through a modern municipal incinerator plant. Dimensions and incinerator bucket specifications are included. Blaw-Knox Div., 2124 Farmers Bank Bldg., Pittsburgh 22, Pa.

How to Build and Operate A Sanitary Fill

146. A complete discussion of many types of sanitary fill construction, together with cost data from communities of all sizes, is offered by the Drott Mfg. Corp. Get this valuable presentation on the Drott Bullclam and International Crawler tractor combination, specially designed for all phases of sanitary fill work, by checking the handy coupon, or write Drott Mfg.

City-Wide Planning for Dual Waste Disposal

243. You can get full details on the General Electric "Disposall" plan for garbage elimination by converting food wastes to sewage. Learn how Jasper, Ind., eliminated garbage cans and collection nuisance with electrical disposal units by checking handy coupon. General Electric Co., Bridgeport 2, Conn.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, 327 Fifth Ave., Pittsburgh 22, Pa. Check the coupon and we will forward your request.

A Handbook of Sewer Cleaning Equipment and Methods

46. A new, fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new Sewe RodeR and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34 Calif.

How You Can Dispose Of Sewage Solids

54. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Dept. PW, Nichols Engineering and Research Corp. 70 Pine St., New York 5, N. Y.

Standard Forms for Concrete Pipe

67. Concrete pipe for sewerage, drainage and culvert projects can be produced quickly and uniformly with Quinn Standard concrete forms. Data on forms for 12" to 84" tongue and groove or bell end reinforced pipe from Quinn Wire and Iron Works, 1621 12th St., Boone, Iowa.

Recording Meters for Parabolic Flumes

73. Engineering data on parabolic flumes and accurate companion meters for open flow water and sewage metering is given in Simplex bulletin 210. Installation data and calibration included. Write Simplex Valve and Meter Co., Dept. 3, 6750 Upland St., Philadelphia 42, Pa.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment; constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Connersville Blower Corp., 510 Poplar Ave., Connersville, Ind.

Your Laboratory Needs Reliable Equipment

123. Laboratory apparatus and chemicals; incubators, microscopes, pH meters, water stills, stirrers, turbidimeters, etc. can be obtained from any of the six branches of the Harshaw Scientific Div. of the Harshaw Chemical Co., Cleveland 6, Ohio. Use the coupon to get your catalog covering full line of water and sewage plant laboratory supplies.

How to Improve Coagulation and Sludge Conditioning

111. "Ferri-Floc," description and instructions for use in coagulation, sludge conditioning and treating industrial wastes, fully treated in a 24-page pamphlet. Tennessee Corp., 619-27 Grant Bldg., Atlanta 1, Ga.

Durable Gratings and Treads Are a Good Investment

147. Gratings for walks around settling tanks and other parts of treatment plants, both out-doors and in, for stairways, floors and balconies, are described in an illustrated 16-page bulletin by Irving Subway Grating Co., 50-53 27th St., Long Island City 1, N. Y.

Comminutors for Automatic Disposal of Coarse Sewage Solids

152. The problems connected with disposal of coarse sewage solids are eliminated by clean, odorless, automatic Comminutors. Full engineering data show the proper model for every size plant and furnish details of hydraulics and typical installations. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

Get All The Facts On Sewage Pumping

155. Be sure to check the features of Allis-Chalmers non-clog sewage pumps that pass solids freely, thus keeping pumping efficiency high. These pumps, offered in standard sizes up to 10,000 gpm, are described in Bulletin 08S7504. Get your copy by checking coupon, or write Allis-Chalmers, Milwaukee 1, Wis.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., Columbus 16, Ohio.

Installation Guide for Transite Pressure Pipe

192. A convenient, pocket-size book of 115 pages covers the whole job from receiving and handling pipe to pressure and leakage tests of finished lines. Over 100 drawings show important operations, and the text tells both how and why. Copies are available from Johns-Manville, Dept. PW, 22 E. 40th St., New York 16, N. Y.

Data Offered On Mixed Flow Pumps

201. Data on the complete line of Worthington Mixflo pumps of the two-vane, non-clogging sewage type is offered in 16-page bulletin W-317-H16. Salient features are outlined, typical sections, performance curves and general data for five types are included. Helpful charts aid shafting selection. Copies available by using coupon or from Worthington Pump and Machinery Corp., Harrison, N. J.

How to Estimate Quantity Of Joint Compound Needed

229. Directions for using Atlas G-K Sewer Joint Compound plus a handy table quantity of compound and jute required per joint of sewer pipe are presented in Bulletin M20-1. Get full data on this permanent joint material from Atlas Mineral Products Co., 10 Pine St., Mertztown, Pa., or use coupon.

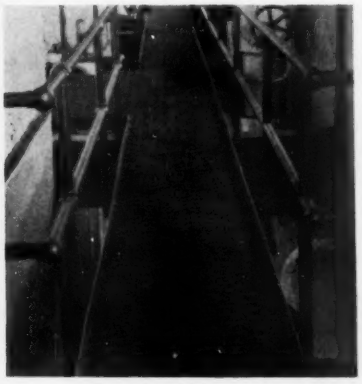
POWER AND LIGHT

Modern Power Plants Need Diesel Economy

43. Baldwin Series 700 diesel engines are described in a new bulletin, No. 320, just issued by the Baldwin-Lima Hamilton Corp., Philadelphia 42, Pa. These engines are four-cycle with a 17-inch bore, 20-inch stroke, 257 to 375 rpm. Horsepower ratings range from 710 hp. to 2,080 hp. Check coupon now for full data.

WHEN YOU REQUIRE WALKWAYS AND STAIRWAYS FOR WATER WORKS OR SEWERAGE DISPOSAL PLANTS

Specify IRVING GRATINGS and TREADS



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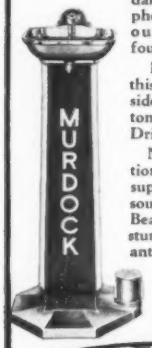
HOW? THAT'S EASY!

How to remove all danger of back-siphonage pollution in outdoor drinking fountains:

Replace them with this latest MURDOCK side-stream foot-button-operated Outdoor Drinking Fountain.

No cross connection between water supply and outside sources of pollution. Beautiful in design; sturdy of construction; anti-freezing.



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MURDOCK

OUTDOOR DRINKING FOUNTAINS

HYDRANTS

STREET WASHERS

ANTI-FREEZING COMPRESSION HYDRANT

SELF-CLOSING ANTI-FREEZING HYDRANT

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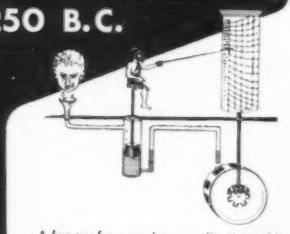
WATER at WORK

250 B.C.



A far cry from modern applications, this unique time piece known as the Water Clock of Ctesibius was operated by tears flowing from the eyes of a statue. The Pointer descended once in 24 hours, actuated by an automatic siphon.

for excellence in MODERN water treatment equipment — gravity and pressure filters — recirculation apparatus

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

ROBERTS FILTER MANUFACTURING CO.

640 COLUMBIA AVE., DARBY, PA.

For more details circle No. 109 on card.

WORTH TELLING . . .

by Arthur K. Akers

● **James P. Cummins** is the new president of **Centriline Corporation,** New York, succeeding **H. Seaver Jones** who was associated with the development of the Centriline cement pipe-lining process almost from its inception 20 years ago. Mr. Jones will continue to serve as a consultant.

Mr. Cummins

Mr. Smith

● **W. R. Smith,** newly-appointed assistant sales manager of the **Buffalo-Springfield Roller Company,** Springfield, Ohio, will assist **Murray D. Shaffer,** director of sales, in promoting Buffalo-Springfield's complete line of rollers.

● **Wilbur & Williams Company** has moved into its own building at 130 Lincoln Street, Boston. They are pioneer manufacturers of protective coatings.

● **United States Pipe and Foundry Company,** Burlington, N. J., has acquired complete ownership of Pontusco Corporation, formerly jointly owned by them and Compagnie de Pont-a-Mousson, of Nancy, France.

● **Stephen B. Hodges,** new assistant sales manager of **Dresser Manufacturing Division,** Bradford, Pa., will concentrate on sales promotional and customer services.

● **Worthington J. Gross** is manager, Governmental Division, of the **Athey Products Corporation,** Chicago, at Washington, with **Bert C. Landstrom,** also new as eastern district representative.

● **R. L. Arnold,** president of **Arnold Machinery Company,** Salt Lake City, is the new president of Associated Equipment Distributors. **H. J. Hush,** of **Griffin Equipment Corporation,** New York, is executive vice-president.

● **The Worthington-Gamon Meter Company** is now a division of **Worthington Pump and Machinery Corporation,** Harrison, N. J., headed by **Robert R. Anderson** as a vice-president of the parent corporation.

● **O. A. DeCelle,** widely known when he was with **Infilco,** is now director of sales and advertising for the **B. F. Gump Company,** Chicago, manufacturers of chemical feeders, grinders, etc.

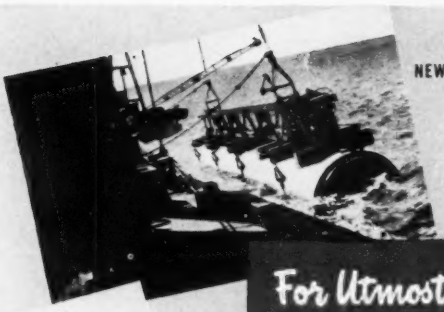
● **Frank G. Hough Company,** Libertyville, Ill., manufacturers of Payloaders, announce **Marshall O. Nystrom** as new district representative for the far Southwest with headquarters in Los Angeles.

● **W. A. Neumann Jr.** is now manager of the **IMO-DeLaval Products Division** of **DeLaval Steam Turbine Company,** Trenton, N. J. He will be responsible for engineering and sales of the company's rotary pumps and power transmission equipment.

Mr. Friel

● **Francis S. Friel,** of **Albright and Friel,** consulting engineers, Philadelphia, has been abroad as a representative of the United States attending the World Congress of the International Association for Hydraulic Research in Bombay, India. Also as a representative of the Fourth International Congress on Large Dams, in New Delhi, India.

● Will some one set us straight by identifying the picture we ascribed to **Hardinge Company's Robert J. Russell** in our February issue? Some day we are going to get technical and quit printing pictures that lack their subject's name plainly written on the back. Gem clips being what they are, too often Joe Doakes' photo gets hooked on to John Doe's news item; with a resultant red face for us later!



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IMPORTANT AMERICAN CITIES INSTALL

LOCK JOINT

CONCRETE PRESSURE PIPE

HARTFORD CONN.

PORTLAND ME.

More than anyone else, those responsible for supplying water for domestic or industrial use appreciate the value of pipe lines which provide these four freedoms:

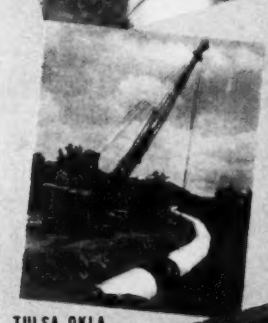
Freedom from:

- ★ Rupture or blow-out
- ★ Maintenance and repairs
- ★ Loss of carrying capacity
- ★ Corrosion or deterioration

The water works man who installs Lock Joint Concrete Pressure Pipe will have trouble-free pipe lines. The careful design of Lock Joint Pressure Pipe does not permit blow-out or rupture; its dense concrete walls are immune to tuberculation, corrosion or electrolytic attack; and its useful life has been estimated by competent hydraulic engineers at more than 100 years. Among Lock Joint's strongest supporters are the water works officials who have installed this type of pipe and who point to it as the most economical in their systems.

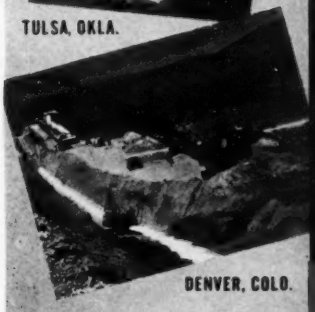
* * *

If you are quality minded yet cost conscious, specify Lock Joint Pressure Pipe, secure in the knowledge that you are receiving the best value the pipe industry can provide.



TULSA, OKLA.

NORFOLK, VA.



DENVER, COLO.

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LOCK JOINT PIPE COMPANY

Est. 1905

P. O. Box 269, East Orange, N. J.

Pressure Pipe Plants: Wharton, N. J., Turner, Kan., Detroit, Mich.

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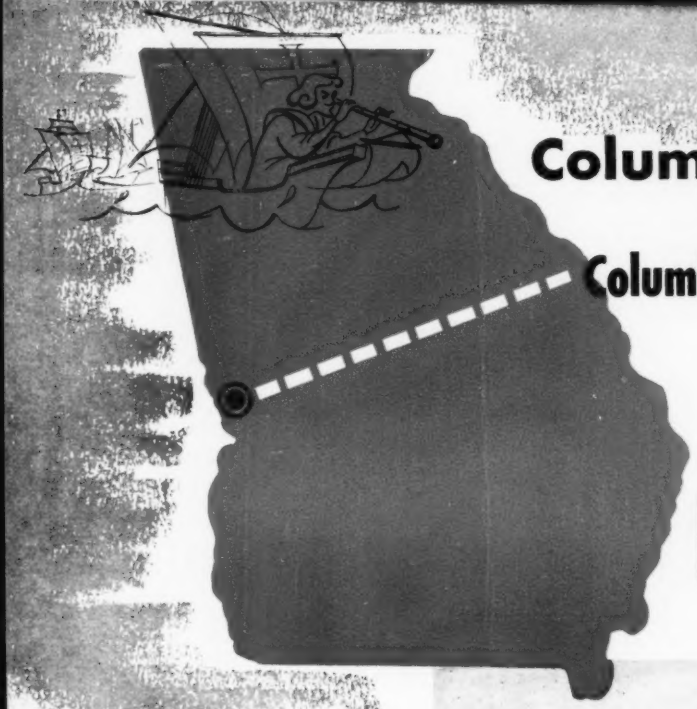
LOCK JOINT Reinforced Concrete PRESSURE PIPE

SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

For more details circle No. 106 on Readers' Service card



Columbus--

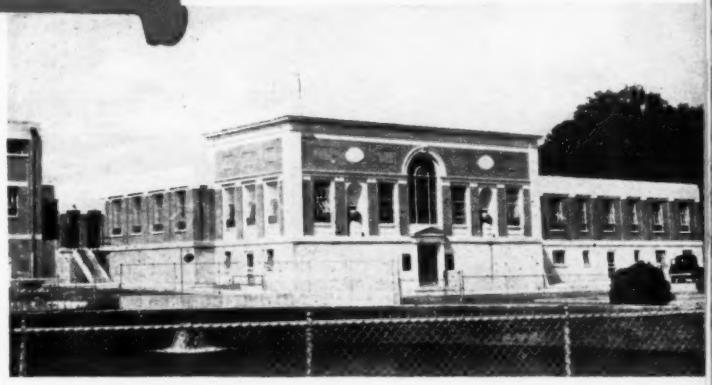
Columbus, *GEORGIA*, that is

discovers

BREAK-POINT

Here's what Mr. George Lowe, General Manager of the 18 mgd Columbus, Georgia Water Works has to say about his experiences with Break-Point:

"... In 1944 when Break-Point was applied at our plant, we promptly received several advantages. We increased filter runs, obtained better coagulation, and eliminated our troubles with slime and algae ..."



Columbus, Ga. Water Works where chlorination by Wallace & Tiernan is on the job

S-5

Such results are typical with the Break-Point Process and dependable W&T Equipment. In the case of the Columbus Water Works, four W&T Master Chlorinators handle pre- and post-chlorination and ensure an average ***free residual*** of between 0.4 and 0.6 ppm in practically all parts of the distribution system.

W&T Equipment is the first choice of thousands of progressive water works across the country because every unit is precision built with custom care to give long trouble-free service.. Such equipment, backed by over 35 years of leadership in chlorination, and coupled with the facilities of a nationwide service staff, insure dependable, proven results.

Find out today how the Break-Point Process —es, cially when coupled with W&T Residual Chlorine Recorder — can help you. Your nearest W&T Representativ will be glad to give you all the necessary information

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